American Machinist

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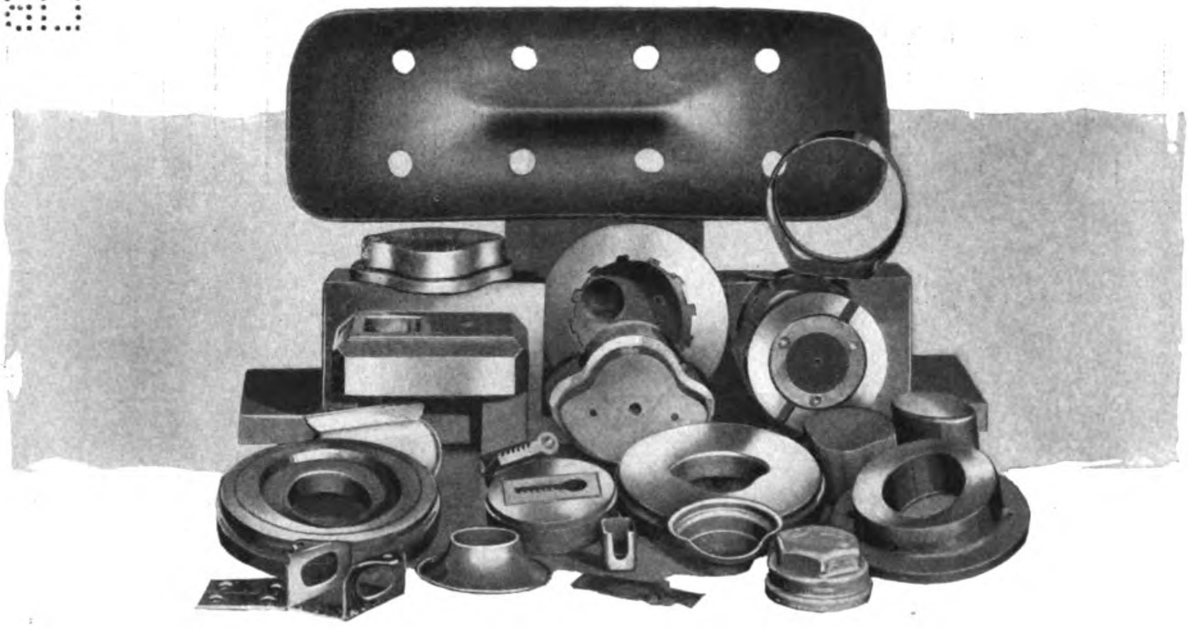

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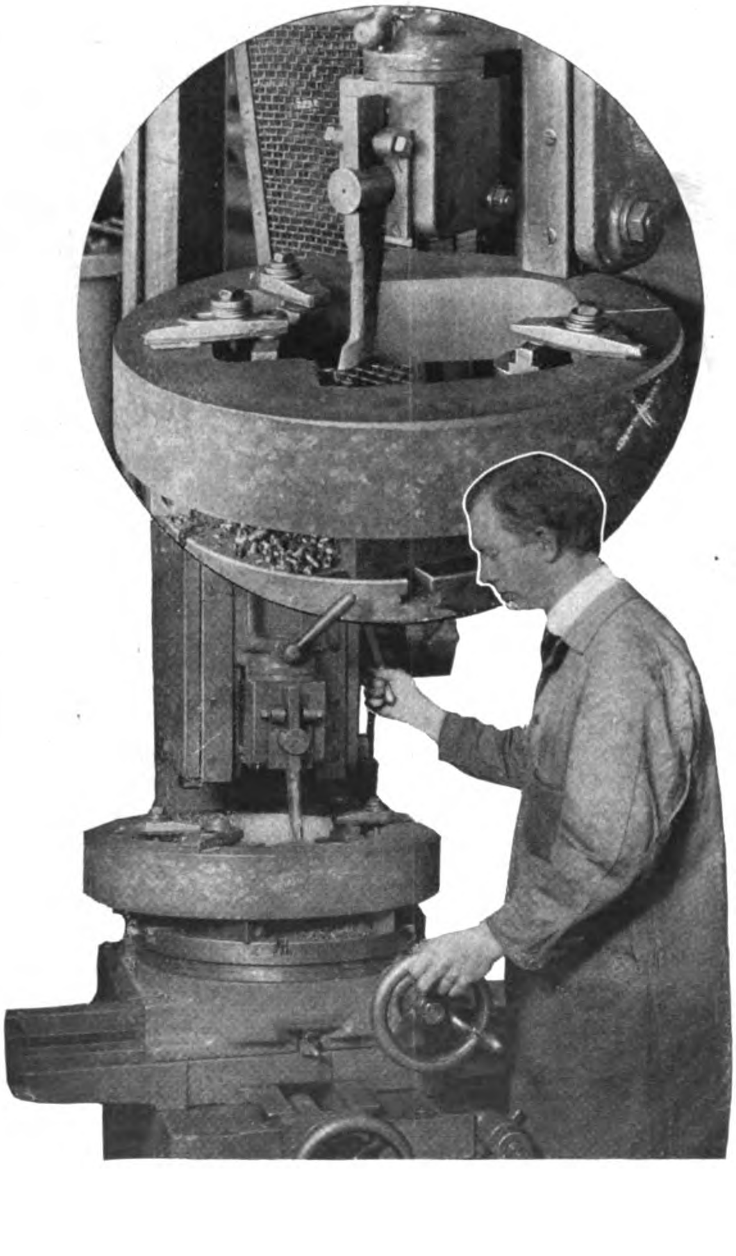

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An Old English Machine for Cutting Spiral Bevel Gears—W. Owen

The articles listed above are to appear in the next issue.

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Yours very truly,

BROWN & SHARPE MFG. CO.

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American Machinist

Volume 56 NEW YORK, APRIL 6, 1922 Number 14

Making a Punch Press Department Safe

How a Manufacturing Company Has Greatly Reduced Accidents—Securing the Necessary Co-operation—Methods and Devices That Helped Make for Safety

BY C. B. AUEL

Manager, Employees Service Department, Westinghouse Electric and Manufacturing Co.

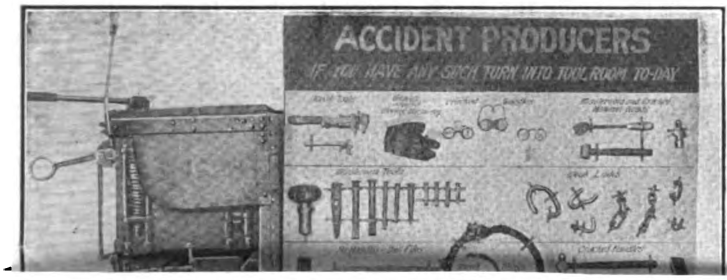
A POWER press is among the most dangerous tools to operate, so that a press department may be considered as having one of the greatest accident hazards in the average manufacturing plant.

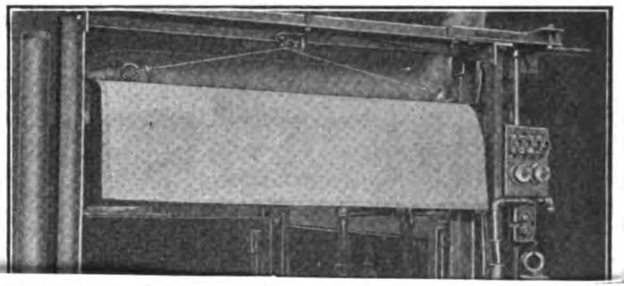
An exception to this general statement is to be found in the works of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., where the safeguarding of the press department has been systematically studied and developed. All safety work is under the direction of the manager of the employees' service department, reporting to the vice-president in charge of engineering and operations. A supervisor of safety appliances has, however, immediate charge of the details of operation and routine.

In the purchase of new tools and equipment, preference is given, other things being equal, to those best guarded; further, when a tool is taken out for repairs, it is guarded if need is shown, before being put back on production.

To assist in keeping every one on the mark, a safety patrol of about fifty members has been organized, most of whom are workmen. Their duty is to patrol their departments one of more times weekly, in order to see that the workers are handling themselves and their tools properly, that gloves are not worn when gloves would be dangerous, that goggles are worn when their non-use would be a hazard, that guards are being used or are not removed, that fire plugs and lights are not covered or blocked by material, etc. Should any infraction of rules be observed by them, the matter is usually reported to the foreman of the department involved. For their service in this safety work, they are paid at their average earned hourly rate.

Meetings of the safety patrol are scheduled at intervals, at which safety matters are discussed by the members and by various of the works personnel as well as by outside experts. In addition, meetings of the department superintendents and their staffs are held from time to time when actual accidents in their departments are reviewed and ways and means discussed to prevent any recurrence. Occasional meetings of the rank and file of the workers likewise take place.





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Thermometer charts are posted throughout all departments so that employees may see the record of their individual departments, the average number of accidents per month for the preceding year as well as the accidents each month for the current year, being given.

Bulletin boards as well as the shop magazine are also utilized to convey information to the employees; but, even they do not fully cover "safety advertising" requirements, so a traveling bulletin board or exhibit has been constructed, on both sides of which are shown actual "accident producers." This exhibit, Fig. 1, is mounted on an electric battery truck, travels slowly up one aisle and down the other, in and out of buildings, reaching the various floors by means of elevators, until practically all employees have had their attention drawn to some of the things that cause accidents.

It is being more and more generally recognized that the mechanical guarding of tools, does not constitute the solution of the problem of accident prevention in the industries, and is but one of a number of considerations entering into this work. Among other items requiring solution as a part of this problem may be mentioned: Labor turnover; good health; cleanliness and neatness (personal and plant); good lighting; pro-

hibition; education (English language at least); carefulness. In carrying out this program in part at least, the press department is kept scrupulously neat and clean; and the aisles are regularly maintained. Excellent lighting, both natural and artificial, has also been provided, the latter consisting of general illumination as well as

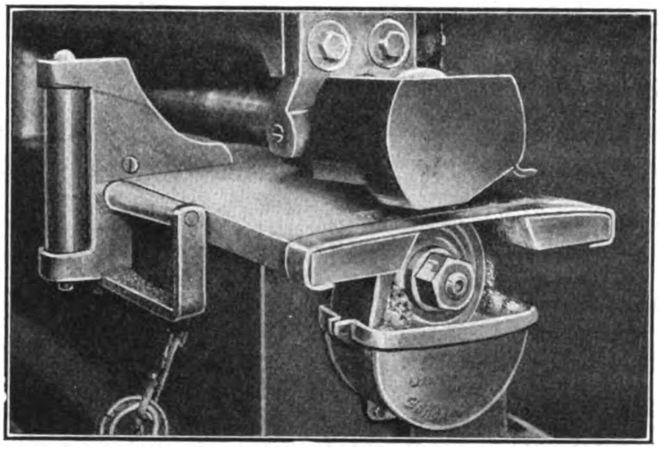
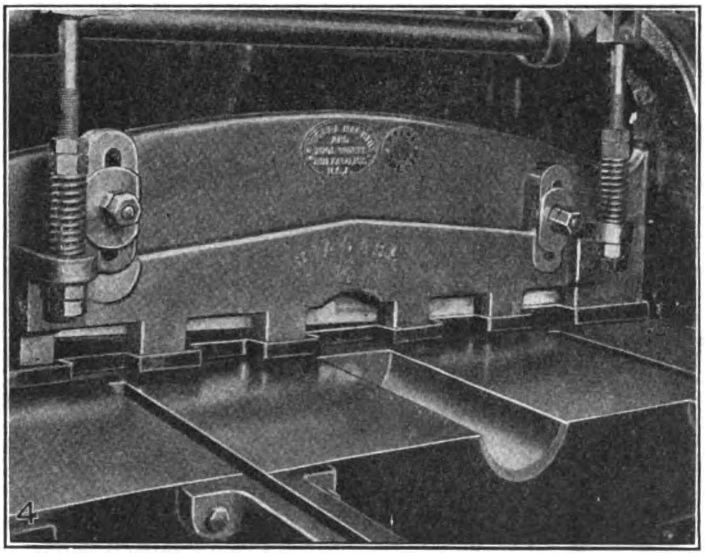


FIG. 3. GUARD FOR ROTARY SHEARS



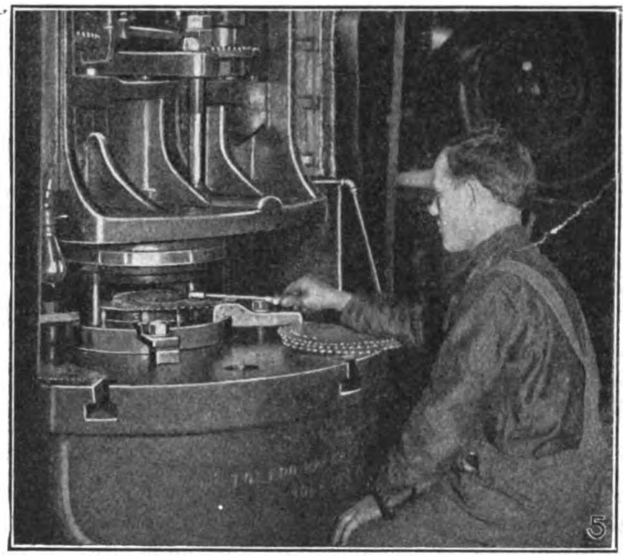


FIG. 4. GUARD FOR SQUARING SHEARS. FIG. 5. USING A SUCKER

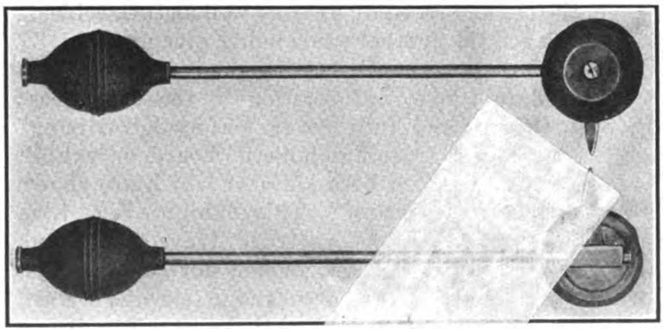


FIG. 6. AN I...

individual lights at the tool wher... ed. The number of sizes and grades of sheet metal used are kept at an absolute minimum and arrangements have been made with the suppliers to ship on wood...

In this way the band irons form... for tying the material into bundles, have b... ...sed with, and unloading, transporting and ... ...ve been greatly simplified. Protective corr... ...rds, or cleats are placed on the floors at corners and along the sides at a suitable distance from the piles, so that passing workmen will not come in contact with sharp edges.

Much of the material used is enameled, some of it in sheets before punching, and where this is the case a device which might be called a box tongs has been constructed, to insure the safe handling of the finished product. In the enameling process, there is a fire hazard since the enamel which is baked on, is of an inflammable material. A very effective hood, Fig. 2, has been provided to smother any fire starting from this cause, the hood being simply lowered over the enameling rolls through which the sheets pass, after which a hand fire extinguisher is quickly turned into the hood.

In cutting the sheets, danger from injury is provided against by simple guards shown in Figs. 3 and 4, the first for slitting shears, the second for the squaring shears.

In the actual punching of material, every effort is made to do the work automatically. If an automatic operation is not feasible, the work is arranged to avoid the necessity of the hands of the operator being placed at any time within the danger zone. Punch presses will almost certainly repeat sooner or later, and bolts, nuts, etc., will become loose, so that any guard which is depended upon to throw the operator's hand out of the danger zone as the press goes into action, is not so reliable as a guard or device which requires the hand to be moved to a safe position before the operation commences.

A unique device for feeding small approximately flat material both into and out of a press is shown in use in Fig. 5. It is a hand sucker (operated by means of a suction pump) which is placed on top of the material, a valve in the handle being opened by pressure of the thumb on a button and the sheet then lifted either into or out of the press. The sheet is released by removing the pressure on the button. This device is also made with two or more suckers at different levels attached to the same handle, for use with punchings of more or less irregular shape. A recent improvement, Fig. 6, has eliminated the necessity for the pump, the suction being secured by squeezing a bulb in the handle

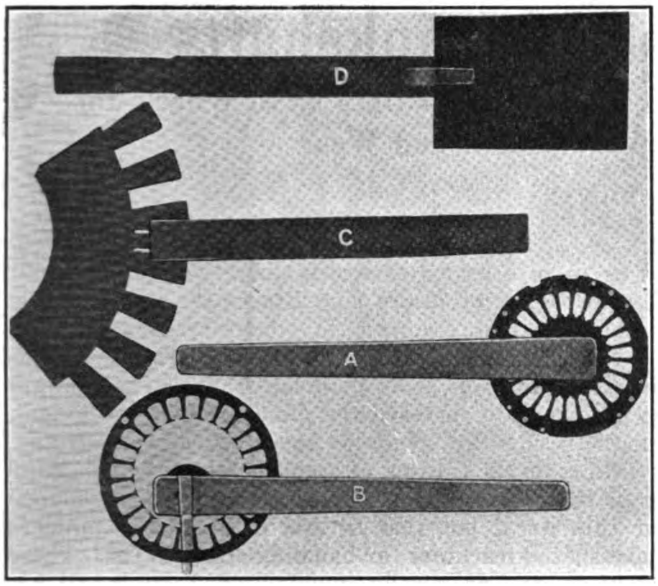
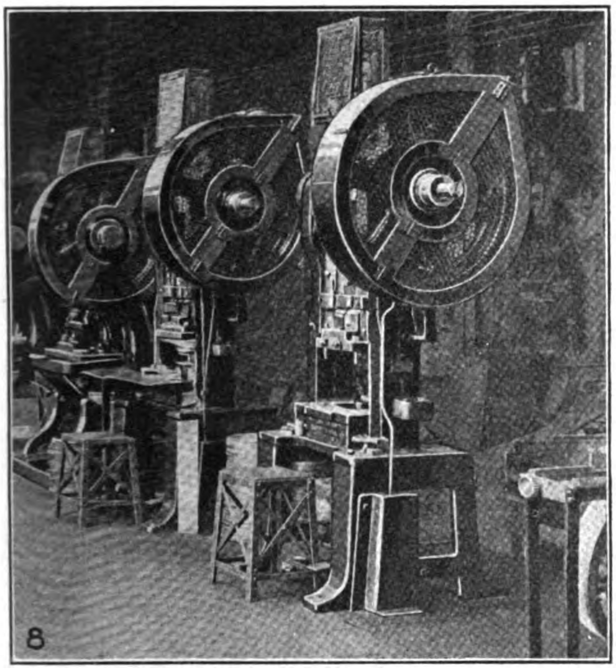


FIG. 7. LIFTERS FOR SMALL WORK



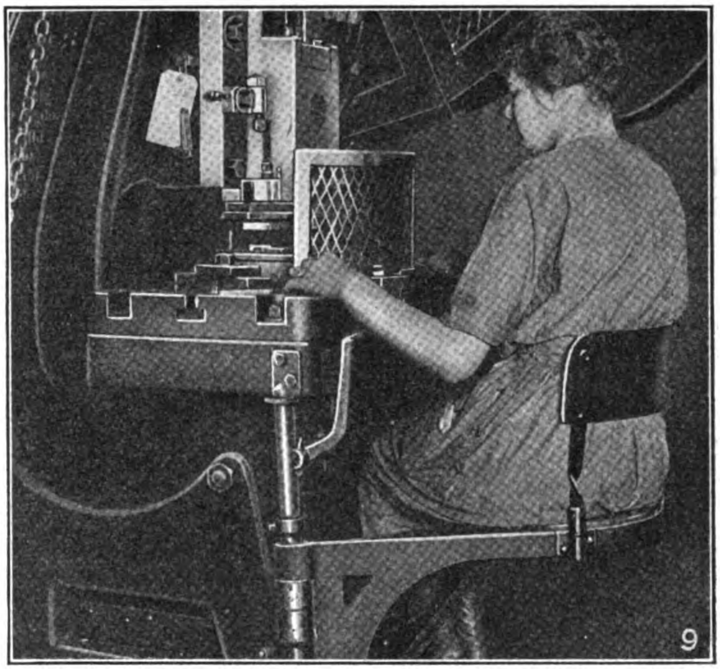


FIG. 8. FLYWHEEL GUARDS. FIG. 9. PRESS WITH INTERLOCKING SAFETY TRIP

and the release obtained by squeezing the bulb again.

Simpler devices are shown in Fig. 7 but they have a more limited range of application. *A* and *B* are of wood, *C* and *D* of metal; the former being provided with felt swabs at the working end which are used for lubricating the dies. The hairiness of the felt enables the punching to be lightly gripped and swept out from under the punch. Should an occasional punching stick, it can be readily loosened by means of the metal finger. Magnetic lifters and special pliers are also used.

A suction device has been developed to apply to the drawing into the press of long heavy sheets. The sucker runs back and forth on a monorail at the rear of the press and is controlled by two parallel rods extending through to the front, one on each side. The handles are gripped by the operator and pushed to the rear until the sucker comes directly over and rests upon the top sheet of the pile of material. When the valve is opened the sucker grips the top sheet which is pulled into position in the press. Closing the valve releases the sucker from the sheet.

In Fig. 8 is shown a battery of presses and illustrates the type of guard used for flywheels. These guards are provided with hinged doors so that no difficulty is encountered in getting at the interior when necessary.

In Fig. 9 is shown a press equipped with an interlocking safety trip compelling the use of both hands. A seat is attached to the frame of the press and can be readily raised or lowered to suit the height of the operator. When not occupied, it can be swung around to the side of the press.

The removal of scrap is at all times an awkward matter, but has been rather simplified by having it gathered from each press before any considerable accumulation occurs and placed in metal cointainers. These containers are then taken to a baling press, and the scrap baled into approximately 190-lb. cakes. The containers are provided with hinged sides and bottoms so that their contents are easily unloaded.

The work of safety is one that should be participated in by everybody, individually and collectively, by employers and employees, by the public, by organized bodies and by the Government; it cannot be carried on by any one group alone, if the most headway is to be made.

The necessity for this co-operation is quite evident when the statement is made that the industries are becoming even safer than the homes and the highways. Of 80,000 fatal accidents happening annually in the United States, approximately 22,000 occur in the industries and 58,000 in the homes, on the streets and along the highways. The knowledge gained by anyone along this line, should be placed at the disposal of the general public, so that the greatest good will result to the greatest number and the sum total of human suffering be the more quickly minimized.

As a contribution to this end, the Westinghouse Electric and Manufacturing Co. will gladly supply, without charge, working drawings, photographs, or other information about the guards in use in its plant.

Machining Automobile Crankshafts

Approved Methods of Machining and Balancing Crankshafts—Data as to Wheels for Various Grades of Steels—Wheel Speed and Wear

BY FRED H. COLVIN
Editor, AMERICAN MACHINIST

THE machining of automobile crankshafts may be divided into comparatively few kinds of operations, although the number of handlings are often more than might be imagined. Roughly speaking, they may be classed as centering, rough-turning,

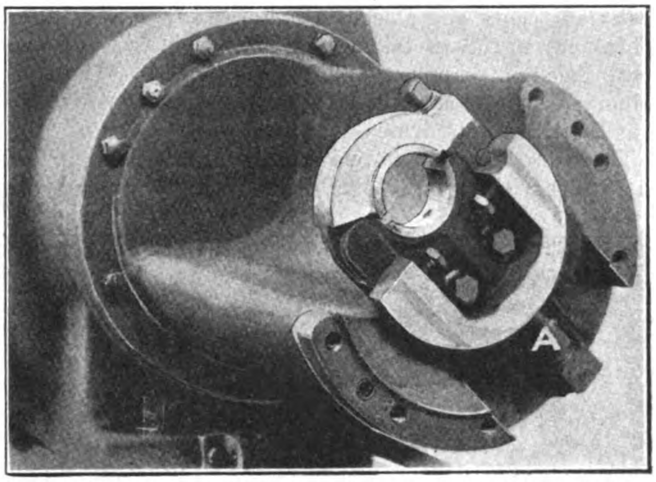


FIG. 1. CHUCK FOR CRANKSHAFT LATHE

heat-treating, grinding, drilling for pressure oil-feed and in some cases milling the cheeks or webs.

In a few instances, the crankpin bearings are ground from the rough forgings, but this is not customary. Occasionally the main bearings are also ground from the rough after the center bearing has been spotted or rough-turned for a steadyrest support. The usual method, however, is to rough-turn all the bearings, both main and crankpin and then finish on the grinding machine, generally dividing the grinding into a number of operations. These grinding operations are frequently sandwiched in between other operations, such as drilling, milling the cheeks, etc., in order to remove any distortion due to springing of the crankshaft by the various operations.

There is an increasing tendency toward pressure feed for lubrication, which means drilled crankpins and main bearings. The oil connection between the two is usually secured by drilling down through the crankshaft cheeks, while in some designs this connection is made by a small copper tube on the outside.

The method of oiling depends on whether the oil is pumped through the crankshaft to the bearings, or whether it is pumped to the main bearings and flows from here through holes in the bearings and oils all connections from the main bearings to the crankpins. In either case, there is an increasing tendency to give a definite allowance for the oil film, usually about 0.015 in., which effectively separates the bearing surfaces and at the same time insures the oil being forced to the crankpins.

There is a tendency in some quarters to abandon alloy steel for crankshafts and use low carbon steel which has been carburized very deeply and hardened so as to present an extremely hard wearing surface. This is bound to secure long life to the bearings and at the same time secure a very tough crankshaft. Unless used with bearings between each crank, such as seven bearings on a six cylinder crankshaft, it might be necessary to increase the diameter to some extent, but the results are, generally speaking, very gratifying.

Taking up the turning of crankshafts we find that the regular engine lathe has been practically abandoned for this work, but that several engine lathe builders make special machines for handling crankshafts. These machines are practically double-headed engine lathes equipped with special chucks so as to clamp the shaft easily and quickly. It is customary to locate from the main bearing and to clamp and drive by the web of the crank. The chucks have adjustments so that the shaft can be moved to give the correct throw to the crankpin. A detail of such a chuck is shown in Fig. 1,

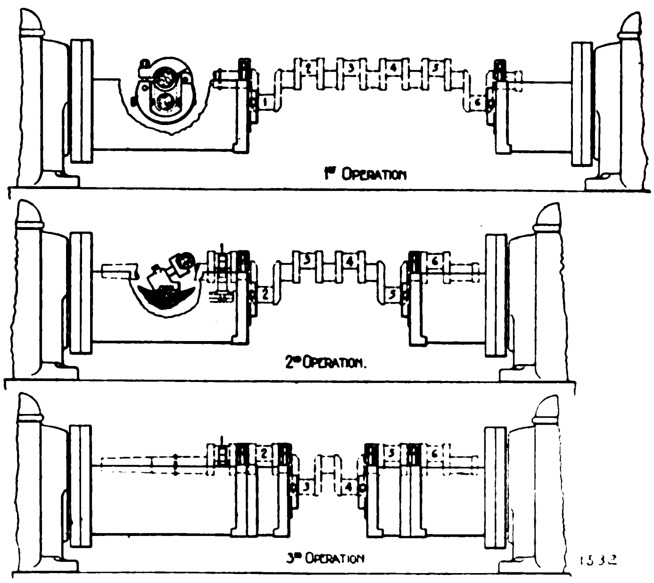
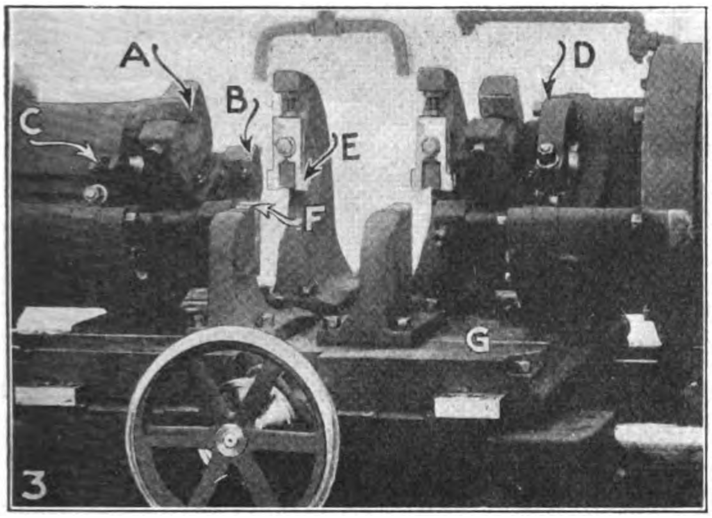


FIG. 2. DIAGRAM OF OPERATIONS

where *A* is a spacing block used to secure the proper throw of the crank.

The outline drawing shown in Fig. 2, shows how the work is planned to always have the cut next to the chuck where it will be supported against springing. Pins Nos. 1 and 6 are turned in the first operation. The heads are then moved toward each other and pins Nos. 2 and 5 are next turned. The third operation turns pins Nos. 3 and 4, the crankshaft being supported in each case by the chuck jaws which grip the crank web beside the pin being turned.

The arrangement of the chuck jaws *A* and *B*, the clamps *C* and *D* and the cutting tools *E* and *F* are shown in Fig. 3. The tool *E* faces down the sides of the crank webs while *F* rough-turns the pins. This illustration shows how the tools are mounted on the flat carriage *G* which has a crossfeed movement only. Lengthwise adjustment, for positioning only, is secured



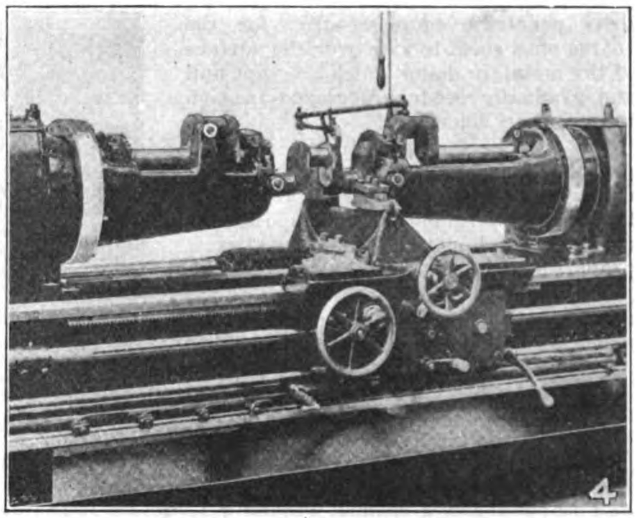


FIG. 3. TOOLS AND CHUCKS IN CRANKSHAFT LATHE. FIG. 4. TURNING A TRACTOR CRANKSHAFT

by the rack shown. Fig. 4 shows a Holt caterpillar crankshaft in place. Both Figs. 3 and 4 show the Lodge & Shipley method of handling crankshaft work. As before stated, somewhat similar machines for this purpose are built by other engine lathe builders.

A somewhat different method of machining crankshafts may perhaps best be distinguished as the multiple-tool method, citing the Lo-Swing lathe as an example of this class. A layout of the tools used in such cases is shown in Fig. 5. This illustration, however, does not show the pin and bearing turning tools, but only the tools for squaring up the crank webs and turning the end of the shaft with its various diameters, shoulders and taper.

The sequence of operations is as follows:

First Operation—	
1. Turn H, G, F 2. Rough square 3. Finish square	Time—12 min.
Second Operation—	
1. Turn A, B, C 2. Turn D and E 3. Neck	Time—10 min.
Total time	22 min.

Further details concerning methods of machining in the lathe will be shown in later articles, from the practice used in making the Peerless and the Rolls-Royce crankshafts.

The details of grinding which follow are largely due to the courtesy of the Norton Company.

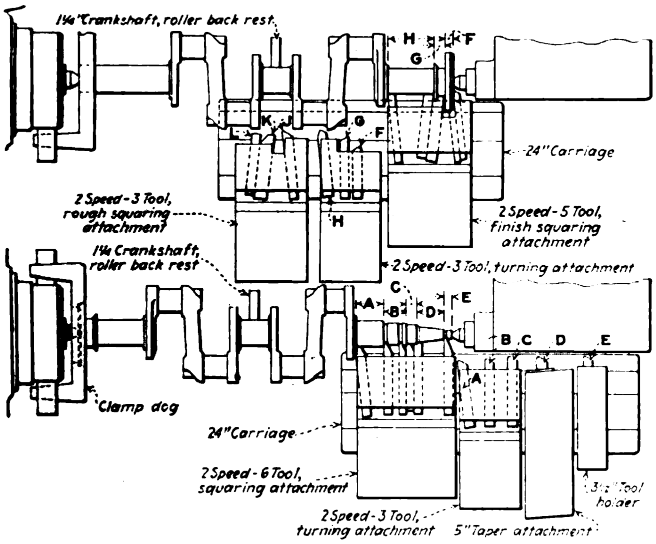


FIG. 5. TOOL LAYOUT ON LO-SWING LATHE

Several factors affect the successful grinding of crankshafts, the material itself being one of the main considerations in the selection of the proper grinding

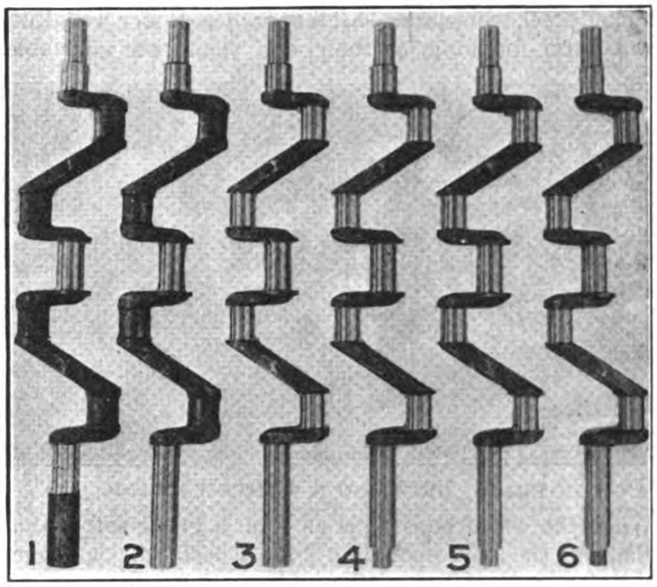


FIG. 6. OPERATIONS ON AN ALL-GROUND CRANK

wheel. For grinding a high tensile strength steel an aluminous abrasive is recommended while a carbide of silicon wheel is suggested for low tensile steel. It is the physical and not the chemical properties of the wheel which are to be considered. The following quotations from W. T. Montague are of interest:

The two physical properties which affect abrasive action most are:

Resistance to penetration. In order to remove a chip, the abrasive must first penetrate the metal being ground.

Tensile strength of the material. The abrasive must stand up to the cut while being forced through the metal.

High resistance to penetration and high tensile strength do not necessarily go together. These two conclusions may be drawn regarding the grinding of materials of high resistance to penetration.

The greater the resistance to penetration, the more brittle should be the abrasive. An abrasive of brittle temper usually fractures with sharper points and cutting edges than a tougher abrasive, hence there is a better opportunity for it to penetrate a hard dense surface.

The greater the resistance to penetration the finer should be the grain of the abrasive. On hard materials the fine

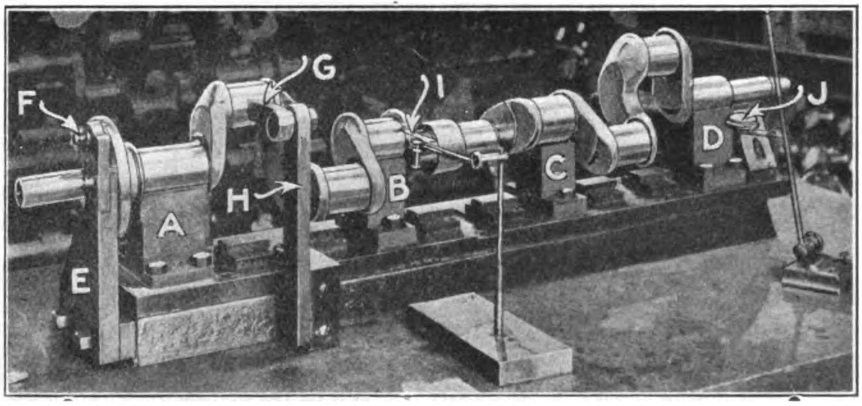


FIG. 8. INSPECTING STUDEBAKER CRANKSHAFT

grits penetrate more readily, for the coarse ones seem to ride over the surface of the metal, in doing which they get dull and gradually produce a glazed face on the grinding wheel.

The tensile strength of the material probably exerts a considerably greater effect on grinding action than resistance to penetration. The metal opposes the removal of chips with a force that is proportional to its tensile strength.

The higher the tensile strength of the metal, the harder it is to remove a chip and the tougher the abrasive must be to prevent fracture while the grain is making the cut. Alundum, the tougher abrasive, is the type to use for grinding steel of high tensile strength.

Crystolon is the correct type for material of low tensile strength. In such materials the brittle crystolon grain is able to cut through without breaking off before it has done its work. Low tensile strength materials offer enough resistance to keep the wheel sharp.

The wheels recommended for roughing carbon steel crankshafts (30 to 45 points) are grain 36, Grade O, alundum; for finishing, grain 24 combination, grade M is recommended. For harder materials, such as nickel steel, wheels as soft as grades N for roughing and L for finishing, or their equivalents are advisable.

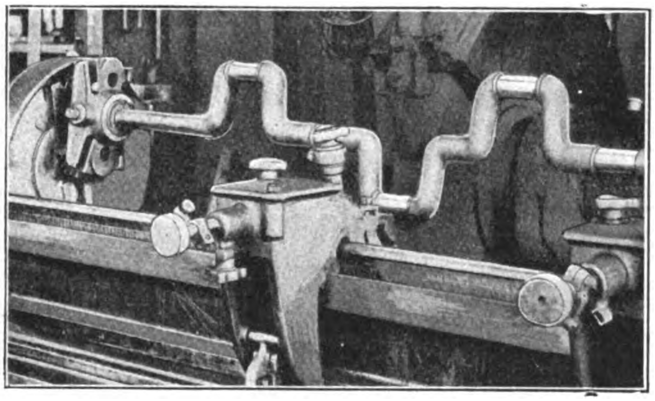


FIG. 7. GRINDING A 3-THROW CRANK

When the wheel is as wide as 4 in. a grade softer than that of the corresponding 2-in. wheel will be found satisfactory.

An "all-ground" crankshaft is shown in its different stages in Fig. 6. The sequence of operations can be easily followed without further description. Fig. 7, shows an unusual crankshaft for agricultural machinery. It has three throws and a central bearing but is not for motor work.

Two tables showing the grinding equipment necessary to secure a desired production may be of service either in equipping a new department or in checking up present performance. Table I is for a small production, 15 four-throw crankshafts per hour, while Table II is for a production of 80 per hour. The stock removed is approximately the same in both cases. Table I is an estimate. Table II is the result of actual production.

A little data on grinding wheel performance is given in Table III. This shows the exact number of crankpins ground, the life of the wheel, the frequency of wheel dressing, the amount of wheel wear, etc. As with the other tables, the figures are of value in checking up your own practice.

There are many points to be inspected on a carefully made crankshaft and many methods used in the final inspection. Fig. 8 shows the method used in the Detroit plant of the Studebaker Co. The shaft has four bearings which are supported by the blocks *A*, *B*, *C* and *D*. The upright *E* is cut away at the top to clear the straight end of the shaft and carries an index pin at *F*, which holds the crankshaft in the three positions

TABLE I. APPROXIMATE GRINDING EQUIPMENT NECESSARY FOR PRODUCING FIFTEEN FOUR-THROW CRANKSHAFTS AN HOUR

No. of Machines	Size	Operation	Stock Removed In.	Hourly Prod.
1	10x50 in. regular..........	Rough 2 end bearings....	0.020	15
1	16x36 in. double head pin machine...............	Rough pins Nos. 1 and 4.	0.020	15
1	16x36 in. double head pin machine...............	Rough pins Nos. 2 and 3.	0.020	15
1	16x36 in. double head pin machine...............	Finish pins Nos. 1 and 4..	0.020	15
1	16x36 in. double head pin machine...............	Finish pins Nos. 2 and 3..	0.020	15
3	10x50 in. regular..........	Rough and finish grind center bearing and finish, two end bearings. .	0.020	15
1	10x50 in. regular..........	Finish grind, gear fit and pilot, outside flange....	0.020	20

necessary to test each pair of crankpins. As shown, Nos. 1 and 6 are in position for testing.

The correctness of the throw angle is tested by the arm *G* which swings on the upright *H*, positioned for each pair of throws in turn. Indicator *I* tests the truth of the shoulders of each main bearing, a multiplying lever showing minute deviations. The dial indicator at *J* tests the roundness of the bearings. Other gages test the length of the bearings and their realization to each other.

One of the crankshaft testing fixtures used by the Lincoln Motor Co. is shown in Fig. 9. The shaft rests

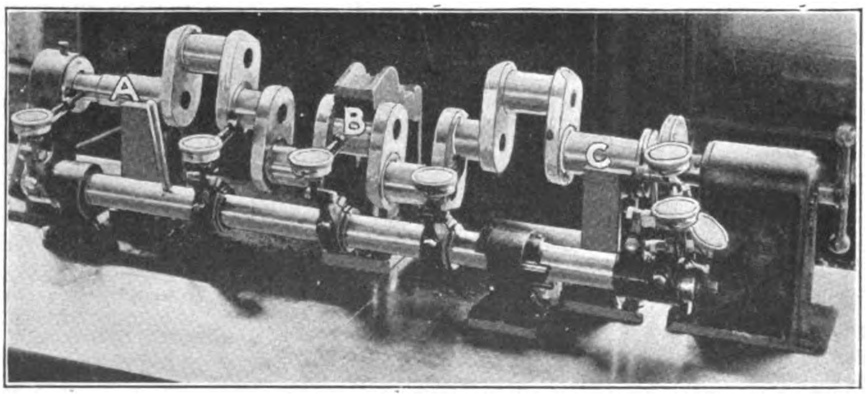


FIG. 9. INSPECTING LINCOLN CRANKSHAFT

on three bearings *A*, *B* and *C* and is held endwise by a spring tension plunger. The lower bearing *B*, is a post set in a fixed position, but capable of adjustment for wear. The upper half is hinged.

The center bearing must show within 0.003 in. total indicator reading when resting on the end supports. It must show within 0.001 in. total indicator reading on the bearing each side of the center when the center bearing is clamped down. This fixture also indicates the flywheel pilot for concentricity and the flange for

TABLE II. CRANKSHAFT PRODUCTION REQUIRED 80 PER HOUR

Operation No.	Description of Operation	Name of Machine	Capacity One Machine Nine Hours	Machines Required
1	Rough grind center bearing for steadyrest	Norton Gr. 10x36	400	2
2	Face web on No. 3 line bearing	17 in. Wickes lathe	400	2
3	Turn and straddle side of center bearing, leaving 0.030 in. for grinding	....	.....	..
4	Turn rear bearing, leaving 0.030 in. for grinding	21 in. x 8 ft. LeBlond and 17 in. x 6 ft. Wickes lathes	400	2
5	Straighten	Straightening press	500	2
6	Semi-finish grind center bearing	10x50 in. Norton grind	275	3
7	Face rear bearing to length	17 in. x 8 ft. LeBlond	400	2
8	Straddle face flange	LeBlond lathes	300	3
9	Turn flange and space, No. 1 bearing	17 in. LeBlond or Wickes	300	3
10	Turn grooves at flange	17 in. LeBlond or Wickes	275	3
11	Rough turn 1.625 in.-1.375 in. and 0.999 in. diameters	17 in. x 8 ft. LeBlond or Wickes	275	3
12	Form oil slinger and turn 2 11/16 dia. on flange	17 in. x 6 ft. LeBlond	600	2
13	Neck 1.375 in. and 0.999 in. diameters for grinding	17 in. x 6 ft. Reed lathe	500	2
14	Cut off and recenter	16 in. x 6 ft. Reed lathe	600	2
15	Recenter flange end for grinding	Allen drill press	1,800	1
16	Finish turn 1.375 in. and 0.999 in	17 in. x 8 ft. LeBlond	425	2
17	Semi-finish grind Nos. 1 and 3	10x50 in. Norton grinds	250	3
18	Rough turn 4 pins	26 in. x 10 ft. LeBlond crank pin lathes	100	8
19	Drill 6 holes in flange	Rockford drill pr	225	4
20	Rough grind Nos. 2 and 3 pins	Landis 16x32 in	200	
21	Rough grind Nos. 1 and 4 pins	Landis 16x32 in	200	16
22	Finish grinding Nos. 2 and 3 pins	Crank pin grs	200	..
23	Finish grind Nos. 1 and 4 pins	....	200	
24	Straighten	Straightening press	500	2
25	Grind flange O.D	10x36 in. Norton gr	550	2
26	Finish grind center bearing	10x50 in. Norton gr	275	3
27	Finish grind No. 1 line brg	10x50 in. Norton gr	275	3
28	Finish grind No. 3 line brg	10x50 in. Norton gr	250	3
29	Grind 2 gear fits	10x36 in. Norton gr	275	3
30	Drill 0.374 hole	Allen drill press	500	2
31	Mill 2—No. 28 Woodruff keyways	Bristol and steptoe mill'g machines	275	3
32	Mill 1—No. 3 Woodruff keyways	Bristol and Steptoe mill'g machines	500	2
33	Burr six holes	Allen drill press	800	1
34	Ream six flange holes	Prentice sldg. hd. dr. pr.	800	1
35	Grind face of flange	10x36 in. Norton gr	550	2
36	Balance	No. 8-B Ransom and Bridgeport grs	275	3
		20th Century bal. stand.	.....	6
37	Face back of flange and chamfer	16 in. x 6 ft. Reed lathe	500	2
38	Hand ream 0.374 in. hole and 2¼ in. holes; also file burrs	4 men	.....	..
39	Lap pins and bearings	Blount speed lathe	250	3
	Straighten	Springfield str. pr	500	2
				110

trueness. The arrangement of indicators on the substantial bar beside the shaft shows how they are used on the bearings and the flange.

Another fixture is used to check the crankshaft shoulders, using spacing blocks and feeler gages. This also checks the radial location of the crankpin bearings. Fig. 10 shows the running balance test on an Akimoff machine.

A convenient method of balancing a crankshaft is shown in Fig. 11, this method being used in the shop of the Lexington Motor Co., Connersville, Ind., in

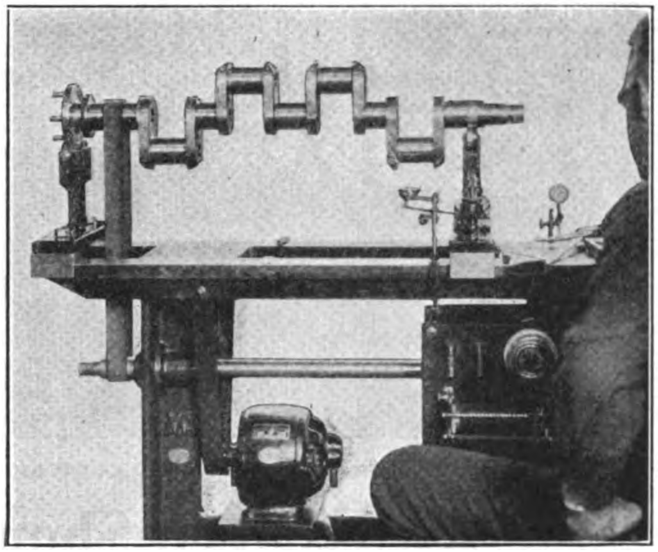


FIG. 10. TESTING FOR BALANCE

marking the Ansted motor. The balancing machine is of the Carwen type but, as will be noted, an electric drill has been mounted conveniently at the back so as to drill out a little weight at any desired point. One

TABLE III. DATA RECORDED AT UNION SWITCH AND SIGNAL CO., SWISSVALE, PENNSYLVANIA

	6636R No. 1	6636R No. 2	36R No. 1	36R No. 2	36Q No. 1	36Q No. 2	46Q
Cranks ground	291	292	270	333	403	356	209
Hours life	20¼	25⅓	22	27¼	38½	29½	14¾
Cranks per hour	14.4	11.5	12.2	12.2	10.5	12.1	14.1
Dressings	17	23	22	24	26	24	20
Cranks per dressing	17.1	12.7	12.2	14	15.5	15	10.5
Cubic inches wheel wear	465	319	495	369	495	369	495
Cranks per cu.in. wheel wear	0.62	0.91	0.54	1.1	0.81	0.96	0.42
Machine used	Landis	Norton	Landis	Norton	Landis	Norton	Landis

Note. The first two wheels are made of No. 66 alundum, 36 grain, grade R. The others are regular wheels.

of the handwheels moves the drill to the desired position and the other wheel feeds the drill into the work. This arrangement saves handling the crankshaft in and out of the balancing machine and enables the proper balancing to be secured easily and quickly.

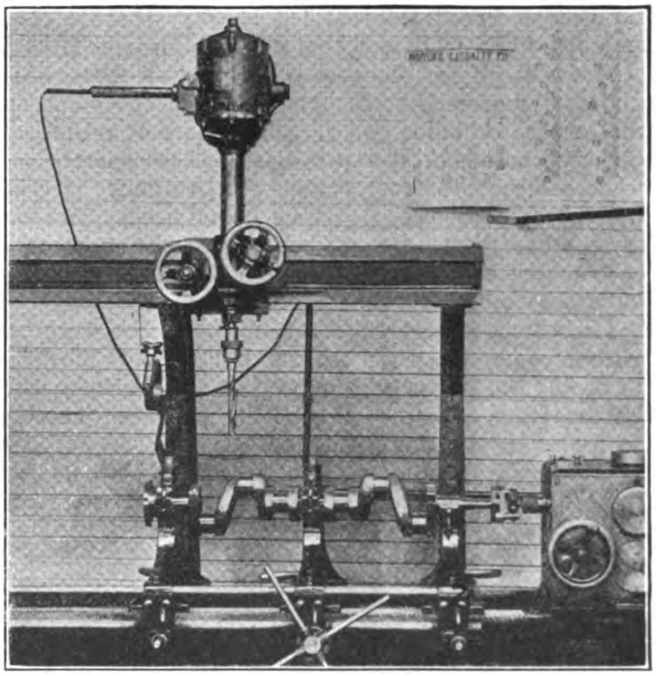


FIG. 11. BALANCING LEXINGTON CRANKSHAFT

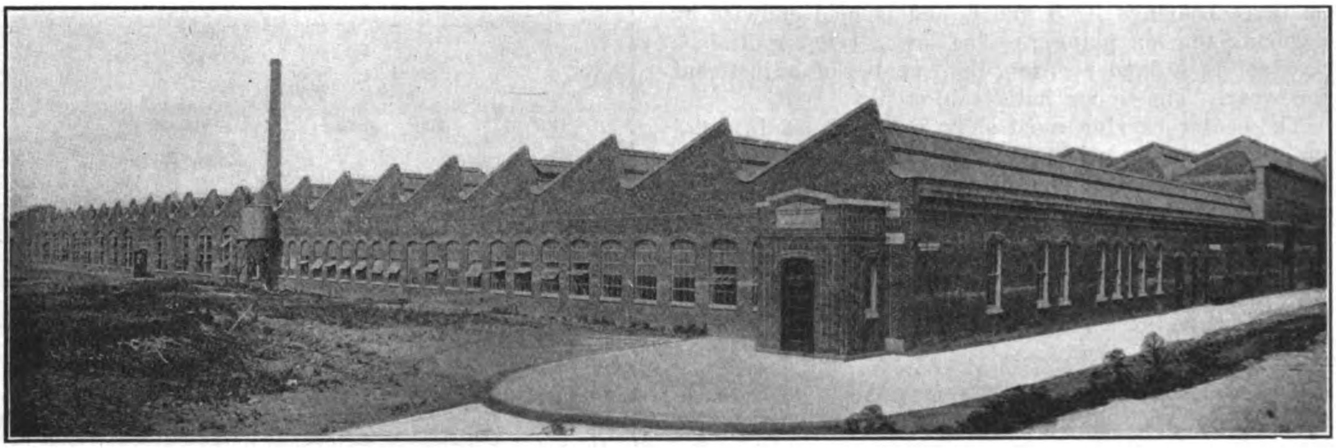


FIG. 1. EXTERIOR VIEW OF THE PLANT

An Eastern Shop of Modern Design

Machine Tool Plant with Saw-Tooth Roof and Reinforced Concrete Frame—Mercury Vapor Lamps for the Shop—Good Railroad and Power Facilities

BY C. E. CLEWELL

THE new plant of Gould & Eberhard, at Irvington, N. J., furnishes a unique example of the good results which may be accomplished by careful advance planning of the shop buildings and their equipment so as to fulfil the exacting requirements of highly efficient production. Fig. 1 shows the general plan of these shops with the main office entrance in the foreground, the plant having a floor area of 135,200 sq.ft., not including the powerhouse.

PLAN OF THE BUILDINGS

In Fig. 1 the shops are shown with their total length of 520 ft. extending to the left, and with a 260 ft. width to the right. This width is made up of eight low bays each 20 ft. wide on the side nearest the reader in Fig. 1, with two high bays, each 50 ft. wide, on the far side of the structure. The low bays have a clearance height of 13 ft. and that of the high bays is 25 ft.

The walls of the shops are of Fisk lock brick which gives an unusually good appearance to the plant and the roof construction and all columns are of re-inforced concrete instead of structural steel. The concrete used was made of cement mixed with suitably screened Bethlehem steel slag, no stone being used. The concrete trusses used for the roof construction were all cast on the shop floors and assembled in place as the building was completed.

The roof consists of red cement tile. The floors are of 6-in. concrete covered with master builders hardener. Back of the shops, the powerhouse and a 40 x 60-ft. heat-treating building are located. These buildings with the 165-ft. Heinicke stack are seen at the right of the center in Fig. 2. The roadways at and about the shops are constructed with a base of slag obtained from a near-by smelting works. Near the powerhouse a sub-structure oil tank with 12,000 gal. capacity is located, with a feeder to the railroad spur, and provided with steam coil to prevent freezing. A 500-ft. artesian well is used for the supply of all drinking water and for the toilets, Newark city water being used, however, for the boilers of the powerhouse.

The outlines of the saw-tooth roof construction and the side wall windows are indicated in Fig. 1. All roof sash has a northern exposure and the window glass is of the ribbed type with the ribs vertically placed so as to diffuse the light in horizontal directions. All sash is of this ribbed type both in roof and side walls except in the two lower sashes of the side wall windows, which are equipped with clear glass for psychological purposes, the management taking the stand that there is a natural tendency for employees to look out of the windows occasionally, and that the use of ribbed glass for all sash to prevent this is a hardship to the men with little or no gain in time.

The Fenestra sash used throughout, is arranged in the saw tooth construction so that every sash in the high bays may open, while the sash in four only of the eight low bays across the shop are arranged for opening. All movable roof sash is hand operated. To avoid excessive glare from direct sun light through the side windows with a Western exposure, a row of oriental planes is planted along the West side of the shop in the adjacent yard space. The shade from these trees is intended ultimately to tone down the bright Western sunlight, which may at times prove objectionable otherwise, due to the absence of near-by buildings of other plants.

The natural lighting is unusually soft and adequate in these shops, even at noon on a summer day, due to the Northern exposure of the roof windows and the diffusing effect of the ribbed glass, and it furnishes an excellent example of the splendid results which can be accomplished in one-story structures even where the width is nearly 300 ft., as in this case.

A good deal of attention was given in the preliminary planning of these shops to the question of a one-story versus a multiple-story structure. The matter of increased land space with the one-story building was not a factor, however, because of the location of the plant in a comparatively unsettled suburb of Newark, with a large tract owned by the company.

The attitude taken in favor of the one-story plan

was based partly on the prevention of delays which always enter into high buildings, because of elevator service, and partly because of what was felt to be a distinct advantage of the one-story building in the flexibility of department arrangements and in the important matter of effective routing of material. Natural lighting is, of course, simplified in the one-story plant if the aisles are wide.

Some of the advantages in routing with the one-story structure will be apparent from the methods used in this plant. Fig. 3 shows a general plan of the shops. A spur of the railroad enters the shop at the left and raw materials are unloaded here. Light parts progress to the right along the low bays, all heavy work being done in the high bays, this also progressing to the right as in Fig. 3. The finished parts meet for assembly at the right end of the shops and shipping is done from entrances at the extreme upper right-hand corner to the railroad spur which runs along the upper side of the shops. The simplicity of this routing scheme with the one-story building could not be realized in a building with a number of stories, and its obvious advantages form the underlying basis for the choice of the one-story shop.

The management has, furthermore, standardized on the unit assembly system and on the method of returning each part after an operation or group of operations to one central inspection department, from which it goes to the next succeeding operation or group of operations.

Ball bearing Chapman hangers and compression supports are used throughout and the efficiency of the line shafting system as a whole is shown by the relatively small power demands on the powerhouse, in comparison with preliminary estimates based on older equipment. The use of single-pulley shaft drives with geared tools is illustrated by this diagram and will be referred to again.

The use of numerous cases of individual motor machine tool drives has reduced the need of line shafting considerably and has been provided for in advance by a well designed layout of floor conduit containing the branch circuits to individual machine tools in conjunction with the two trenches or tunnels which extend the full length of the shop down the center, and which run back to the powerhouse as indicated in Fig. 3.

The supports for line shafting are made up of I-beam framework suitably attached to the concrete shop columns by special clamps, and a great degree of flexibility in the alignment of pulleys and adjustment of belts has been found to result from this scheme. A given line shaft with its single pulleys is driven by a group motor supported from overhead, belted to a larger pulley on the line shaft. The generating equipment of the powerhouse consists of a 500-kw. Sprague direct-current generator, direct connected to an 800-hp. slow-speed Corliss engine. Two Sprague 15-hp. balancers are employed with the main generator, to make possible the use of a three-wire system which gives pressures of 110 and 220 volts throughout the shop.

For break down service, a 100-kw. rotary converter is installed, by which the alternating current supply of the public service station may be converted into 110 and 220 volts direct current in case of emergency. An additional safeguard in the event of a powerhouse break down, is a transformer outside the shops, which is connected to the public service lines and which can be used for certain lights, for the watchman's lamps and for the dictating machines. In this way, it is possible to operate the Mazda lamps in the offices and drafting rooms for artificial lighting independent of the shop powerhouse, in case of necessity.

Attention, in the design of the powerhouse, has been given to additional space in case of expansion to the plant and to details which add greatly to the appearance of the plant. Thus, room has been allowed in the generating room for an additional engine and generator as a duplicate of the present equipment. As an example of the care to details of appearance, the pit under the generator frame is lined with white enamel bricks and a generous supply of natural light is afforded by the side wall windows. Complete switchboard arrangements are available for the convenient changeover from the powerhouse supply to the breakdown service of the public service company.

The boiler room, as part of the powerhouse, contains three 250-hp. Babcock & Wilcox boilers, two of which are used at a time with a third as a reserve and with provision of extra floor space for one additional boiler if required later. Superheaters are used with the boilers and all boiler fittings are made of brass, which are expensive but more lasting.

The coal is transferred from the adjacent coal bunkers to bins above the furnaces, which are equipped with Murphy rocking grate stokers. The coal bunkers are on a level with the boiler room floor and are under two tracks of the railroad, provision being made in the roof for unloading the coal from the cars either through the floor of the car or by shoveling it over the side of the car through openings in the roof beside the tracks.

At the base of the stairway leading from the engine room to the boiler room there is a tunnel opening, this tunnel extending from the powerhouse across the open yard space to the shops and through the entire shop under the center of the floor space. This tunnel is 7 ft. high and is constructed in two sections, with a concrete partition between. One section carries the electric supply circuits in conduit, and the other contains the steam, water and sewer piping. This tunnel is open at the north, or extreme shop end for ventilation pur-

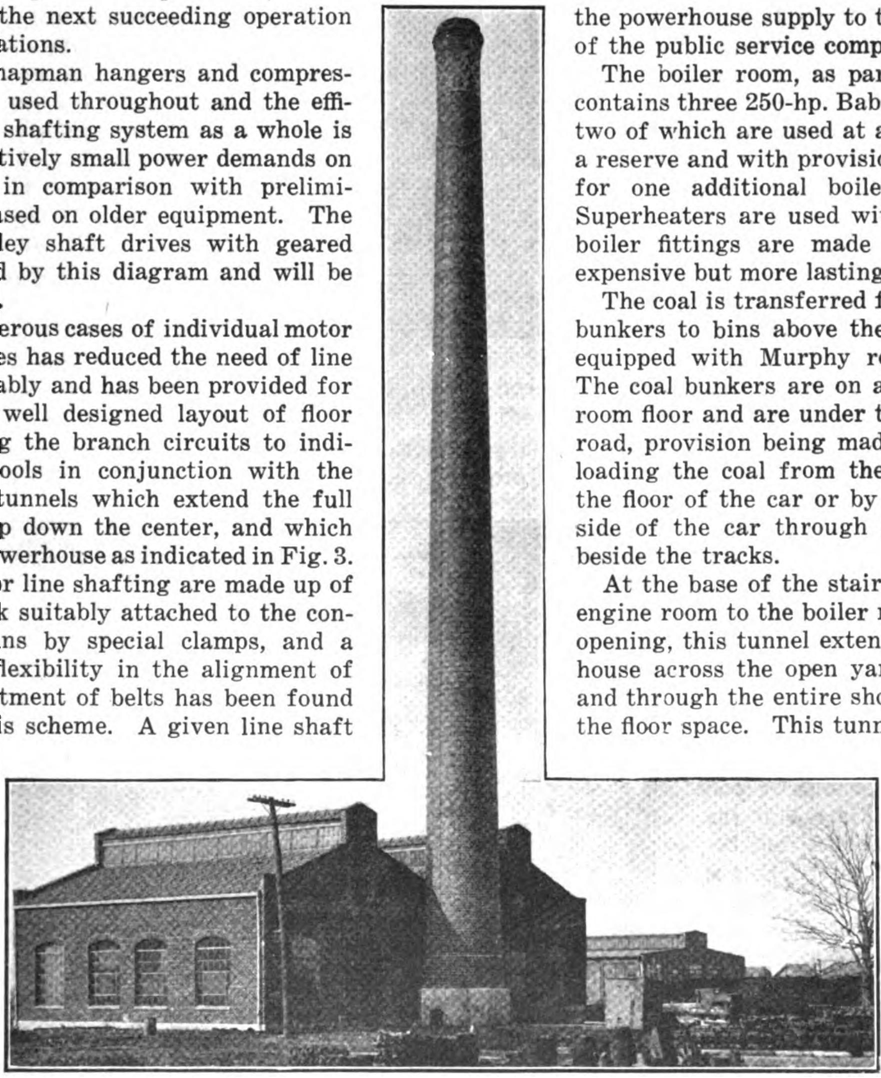


FIG. 2. EXTERIOR VIEW OF POWERHOUSE. THE RAILROAD TRACKS FOR COAL SUPPLY AND SHIPPING PURPOSES RUN BESIDE THE POWERHOUSE

poses, is properly drained and lighted, and is provided with a manhole every 100 ft. throughout its length. The tunnel serves as the distributing point for the electric power branch circuits for lamps and motors.

The disadvantage of having a separate office building as a hindrance to the expansion of the shops, led to the adoption of a portion of the shop space for the offices and the drafting, production and planning room, shown in Fig. 4. In other words the bays of Fig. 4 are provided with the necessary support openings in the roof trusses and in every respect are adapted to quick conversion into manufacturing space if this should be necessary at any time. It may be stated here that it is possible to extend the plant at any time 100 ft. on the North, 150 ft. on the East and 100 ft. on the South. An excellent idea of the general arrangement of the 60 x 100 ft. drafting and associated departments is given in Fig. 4. At the left the large special 8 x 16 ft. desks are shown, each of which provides space for six employees. The concrete roof trusses are also clearly visible in this view and the space between the sloping trusses and the roof may be seen, this providing incidentally a good space for holding the conduit used for the lighting or power circuits. Note the side wall windows and the light color of the concrete surfaces.

The offices are adjacent to and north (at the left in Fig. 4) of the drafting room, with a partition between. Practically no partitions are used, however, for individual offices except in one or two instances, and where such is the case 4-in. hollow tile is employed for the partition. An interesting feature of the office is the use of skylight sash horizontally placed over the offices which conceal the saw-tooth construction and give a finished appearance to the space.

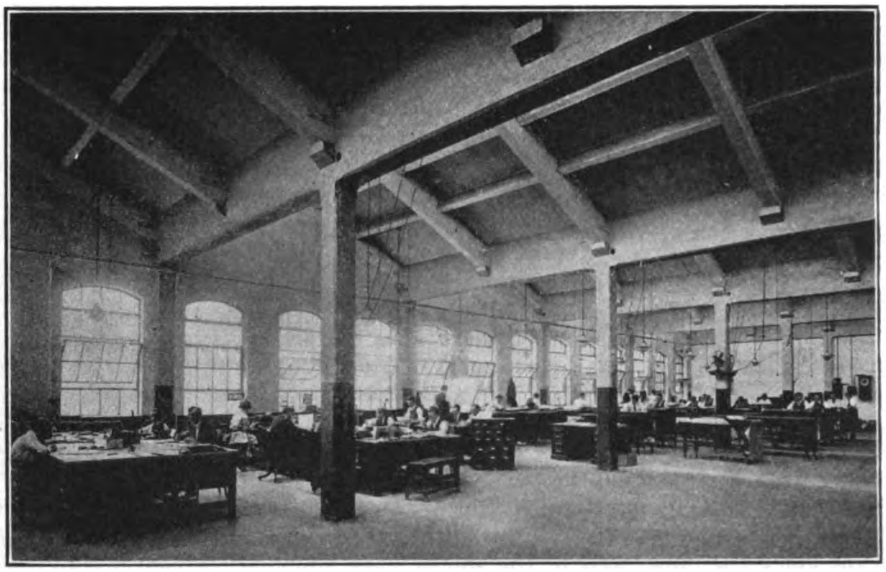


FIG. 4. DRAFTING, PRODUCTION AND PLANNING ROOM. SHOWING LARGE DESKS ACCOMMODATING SIX PEOPLE EACH. NOTE ROOF DETAILS

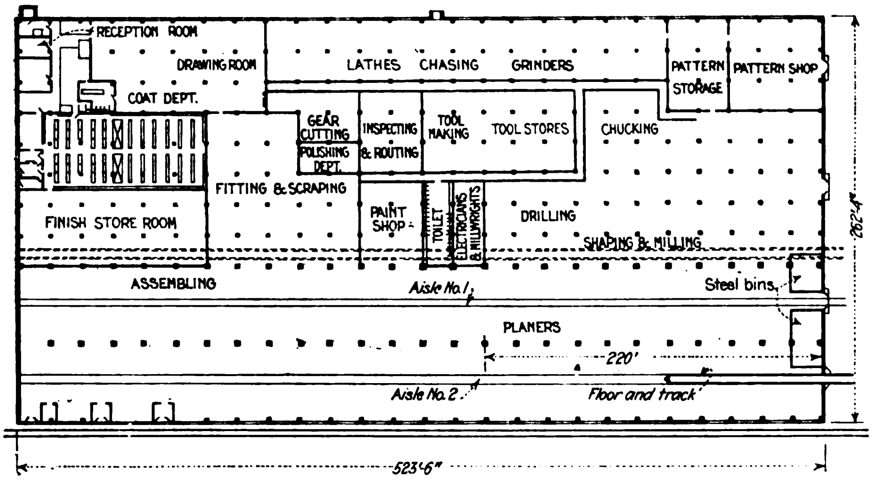


FIG. 3. GENERAL LAYOUT OF PLANT, SHOWING BUILDINGS FOR SHIPPING

This auxiliary sash is slightly separated from the holding frame to produce ventilation. In Fig. 5 the aisle of one of the high bays is shown, this being a general view of the assembling department. In the distance, the entrance for raw materials may be seen, this doorway being large enough to admit a freight car. This assembly section is near the north end of the shop and near the shipping department. Note that these two high bays contain the large sizes of work, while the smaller work is mainly confined to the low bays at the left, seen in the distance. This view shows the reinforced concrete runway for the cranes, which is an interesting structural detail of the plant.

In Fig. 6 there is a view of the scraping department that shows a portion of the low bays. This picture gives a good idea of the method of mounting clamps on the concrete columns for holding the small crane runway.

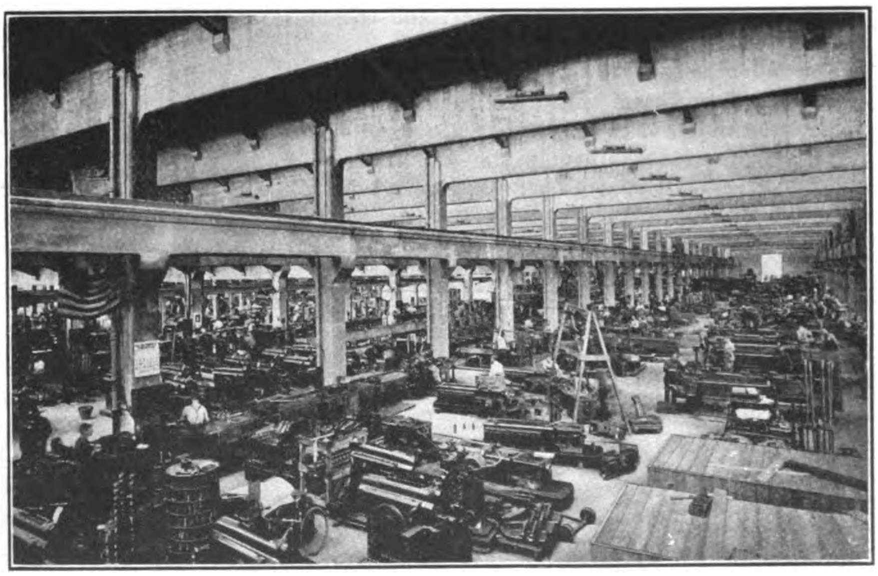


FIG. 5. GENERAL VIEW OF ASSEMBLING DEPARTMENT SHOWING THE HIGH BAYS. NOTE REINFORCED CONCRETE CRANE RUNWAY

One of the most interesting details of this plant is the absence of vibration and the greatly reduced noise in comparison with a structural steel shop. It is difficult to realize in the drafting room, separated from the shop only by a 4-in. hollow tile partition, that the shops are running under normal conditions. The use of concrete runways for the cranes, with pine boards under the track, almost completely removes crane vibration.

The shop work is conducted on the hourly basis with the addition of a premium system. Time keeping is based on the periodograph. Due to the distance of the shops from the nearest trolley line, the company maintains the equivalent of a bus service to and from the plant in the morning and afternoon by converting its freight trucks into buses, temporarily, by putting a special body on the truck shortly before it is needed.

The fireproof construction of the plant makes a shop fire alarm system unnecessary and no fire protection is provided except an extinguisher system for the shipping room. The watchman uses a portable clock with keys at set stations, as usual in such cases. The trucking problem is simplified by manufacturing as far as possible from platform to platform. Hand trucks are used with no electric trucking devices.

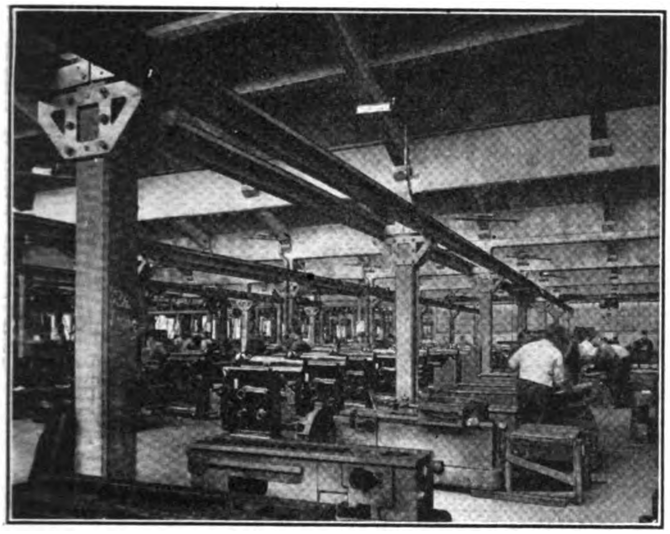


FIG. 6. SCRAPING DEPARTMENT. NOTE CLAMPS ON THE CONCRETE POSTS FOR SUPPORTING CRANE RUNWAY

(*To be continued in next month's issue.*)

Tap and Die Standardization

To effect economies for consumers by introducing improved, and eliminating archaic styles, types and sizes is a primary purpose of the Tap and Die Institute. It is estimated that since 1917 when intensive work of this character was actively taken up, the total reduction of lines in the small tool industry has approximated 40 to 50 per cent. In this it functions somewhat as a central laboratory for the receipt and analysis of information which is distributed throughout the industry and among consumers in the form of a standard catalog containing standards based upon consolidated experience.

This catalog being the summarized demand is an educational influence and, because it is known to embody the best and most modern engineering practice, tends to induce consumers to adopt its recommendations. No attempt is made to force their acceptance.

What Are the Worker's Prospects in the Machinery Building Industry? —Discussion

By George J. Buckner

Having read the article on page 667, Vol. 55, of American Machinist, under the above heading, I have thought the matter over from as nearly an impartial point of view as possible, and I must say that I cannot agree with the writer in the position he takes toward the college man.

I am a college graduate, have worked in machine shops with and for both college and practical men, and have found very admirable men of both types. I have been very much disgusted with graduates at times because of their apparent lack of ability to go ahead with a job without constant help. But I have come to the conclusion that these are rather the exception than the general rule.

There are misfits in every trade and profession and diploma holders are no exceptions. I believe that the "boss" who has received his training through the school of hard knocks is too apt to judge the whole class of college men by the small group known as "rah rah boys," whose fathers sent them through school in luxury and ease. These boys amount to little on their own merit.

Consider the average graduate. He is eager to work, to learn and to move ahead. He very seldom makes as good a mechanic as the boy who started at fourteen. And why should he? He is handicapped with an eight years' start on a job which requires more skill in manipulation than quick thinking and general knowledge. The latter is the field in which the student has been trained. But turn him loose on a new problem, such as re-arranging the equipment of the shop for large production on a new type of work, and he will surprise you with the number of unseen details which he will take into account in his scheme.

If he has a half a chance, the college graduate will become a leader, not because he is a better mechanic than the others, but because he has a bigger, broader view of the work around him. The supply of jobs for leaders is relatively low and there will necessarily be many college men, who have been side tracked into positions of small importance. But you will usually find them ready and equipped to step into a vacancy above.

To quote from Mr. Bruce Barton's interview with Dr. James R. Angell in the November issue of the *American Magazine:*

"A notable instance of the value of college men is furnished by the Western Electric Co., which began employing college men about 1896 and which has found that 90 per cent of them made good, as compared with 10 per cent of the men who enter business on leaving high or grammer school."

In looking over the list of executives in our own company, at the local plant of which about 7,000 men are employed, I find that 80 per cent of the highest officials, 70 per cent of the superintendents and 60 per cent of the assistant superintendents are college men. And only 1 per cent of all the men in the country are college graduates! I am very reluctant to believe that fathers are spending thousands of dollars, states and cities spending millions, and men and women spending four good years of their lives to find out that it is all in vain.

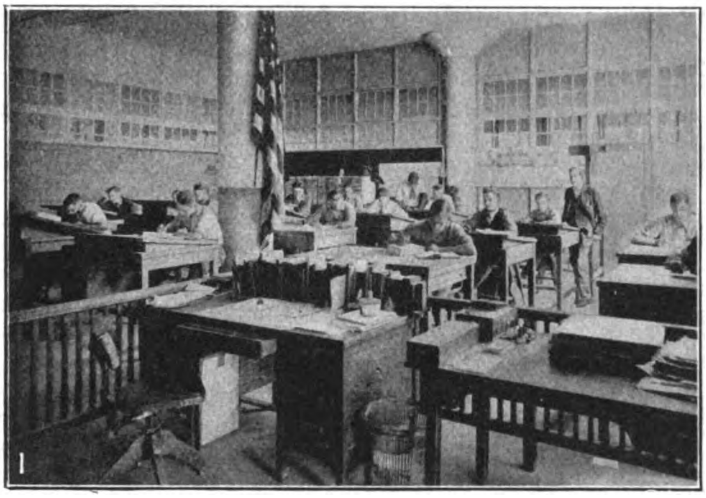
Apprenticeship System at Rock Island Arsenal

Devices for Teaching—Use of the Slide Rule—Action of Gear Teeth and the Selection of Proper Views for Drawings—An Outline of the Courses Given

BY WILLIAM BAUMBECK
Superintendent of Production

DURING the past year much has been written about the apprentice system established in manufacturing plants and very valuable information has been given regarding the methods to educate boys for a trade and later for better positions. The public at large, and especially the machine tool manufacturers, possibly do not know that the Government in its several arsenals and navy yards has established an apprentice school system for machinists, patternmakers and other trades. This article has been written to tell about the apprentice school and the course of instruction given to the boys at the Rock Island Arsenal.

The school was established May 16, 1910, with one student. Since that date, and up to Dec. 31, 1920, one hundred and three students have been graduated, and on May 1, 1921, eighty-three apprentices were employed. The year 1920 being the most successful and the one in which the largest class was graduated, the system of instructions used during that year will be shown.



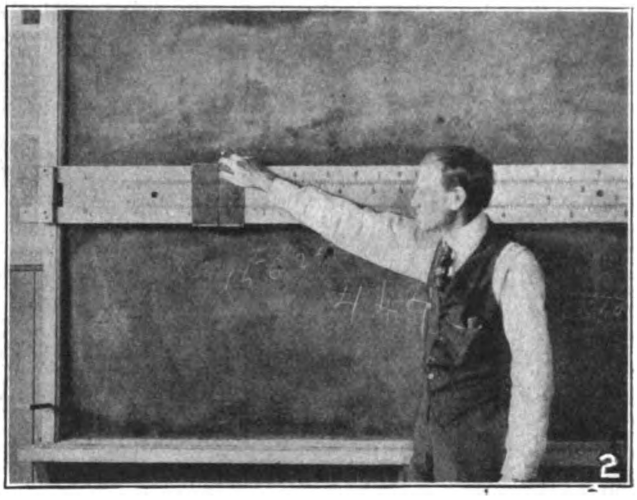


FIG. 1. THE APPRENTICE SCHOOL. FIG. 2. LARGE MODEL SLIDE-RULE

The instruction courses are made as practical as possible with the idea of making efficient mechanics of boys who have not had high school or special training. Mechanical drawing and mathematics have been selected to fit conditions, and each student is expected to and must make such progress as his capacity and interest to learn will permit.

The course of instruction is divided into nine grades. Six months' service constitutes one grade, with the exception of the ninth grade which requires twelve months' service and is known as the fifth-year course. In a way it is what is commonly known as the "part time, short unit course," as advised by William A. O'Lary and Charles A. Drosser in United States Bulletin No. 159, with the exception that this course aims to develop the initiative and resourcefulness of the apprentices more fully.

A schoolroom with drawing tables, library and other study facilities is provided as shown in Fig. 1. Drawing paper, ink, pencils, etc., are provided by the Government. The students are required to furnish their own drawing tools. Mechanical drawing plates are used from those issued by the International School of Correspondence and the Santa Fe System, but mostly copies of drawings used on production work at the arsenal are furnished for test uses.

Students are given four hours each week for instruction in the classroom—two hours on drawing and two hours on mathematics. They are required to work examples, make detailed drawings and submit them for correction. Every two months examinations are held and work rated accordingly. No specified day is set for examination so that no special efforts can be made in advance by the boys, who, in consequence, are sometimes caught unprepared.

Records of attendance, class work and deportment are kept on permanent cards.

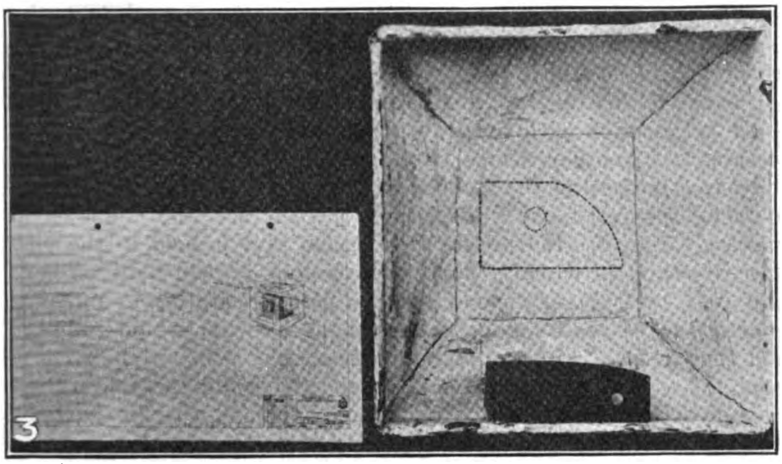
The following instruction books on mathematics are used:

1st year—"Shop Mathematics" Part 1, Morris & Smith.
2nd year—"Shop Mathematics" Part 2, Morris & Craig.
3rd year—"Practical Applied Mechanics," J. W. L. Hale.
4th year—"Practical Mechanics and Allied Subjects," J. W. L. Hale.

First Year: The first two periods of the first year course involve a review of much of the eighth-grade work in the common schools, passing on to studies in shop mathematics, drawing and applied science. In the review work much emphasis is placed on those subjects which pertain to shop practice, as ratio and proportion as applied to pulleys and gears and mensuration as applied to volumes and areas. After this review the subjects of levers, inclined planes, horsepower, hydraulics and heat units are covered in turn.

The arsenal is fortunate in having a well-equipped testing laboratory at its command and much of the instruction received in the schoolroom is further supple-

NOTE: Instruction procedure and special instruction devices contributed by the originator G. E. Stanford, instructor of apprentice school.



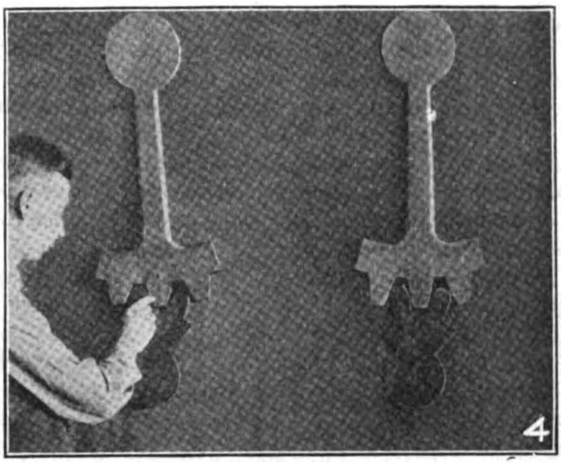


FIG. 3. MODEL TO TEACH PROJECTION. FIG. 4. MODELS OF GEAR TEETH

mented by instruction in the testing laboratory. Individual instruction is the rule at all times, this method maintaining the interest of the student while the instructor is better able to meet the individual needs of the student, and to inspire and influence him.

Second Year: The third and fourth periods, or second year instructions, are given in what might be called shop mathematics, involving algebra, geometry, trigonometry and logarithms, in so far as these subjects pertain to shop practice. Before the apprentice is through with the above he has passed from the second year and is well along in the third year or fifth and sixth periods.

Third Year: By the time the boy has reached the sixth and seventh periods he is usually well enough advanced in age and experience to understand and appreciate the value of the school in respect to learning a trade, and is in need of guidance more than encouragement and inspiration. Much time is devoted to review of subjects already given and many practical applications relating to trade problems are made at this time.

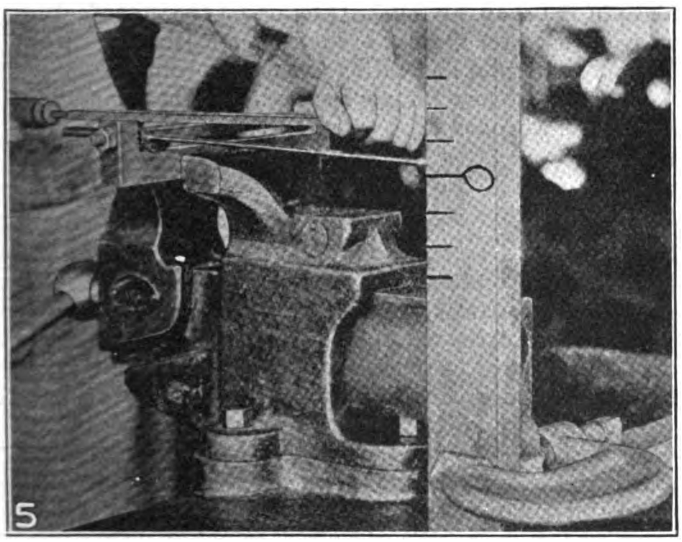
Fourth Year: Through the seventh and eighth periods, or the fourth year, some special subjects are taken up such as electricity and strength of materials, in so far as they pertain to shop practice.

Fifth Year: The fifth year, or ninth period, is optional and the boy is in fact graduated in his fourth year. If he chooses the fifth year, and the majority of boys do so, and has at the same time completed all the subjects prescribed, he is given further instruction relating to application of principles already learned. This course is largely made up of laboratory work pertaining to practical mechanics. Most of the apparatus can be made by the apprentice as he proceeds in the studies. In this particular he gets much experience in the testing laboratory, previously mentioned in this article.

During the entire time very simple principles of teaching are employed. No attempt is made to organize classes as such and every effort is made to inspire a boy to do his best. Practically the whole system of teaching is based upon the one word "interest" which, interpreted in every-day language, means "it is between us." The instructor feels that in order to teach successfully he must first know well the subject, be able to impart this knowledge and also to inspire the pupil.

The purpose of this course is not to make finished draftsmen, but to enable the boy to read correctly certain drawings as used at this arsenal. The course in drawing as given here is what might be considered by some "a mongrel course" inasmuch as it is made up of drawings taken from several sources, always with the idea in mind of the particular needs of the boys.

Much that is considered worth-while in a complete course is omitted here; for example only eight plates are given in geometric construction and intersections. Throughout the entire course an effort is made to teach



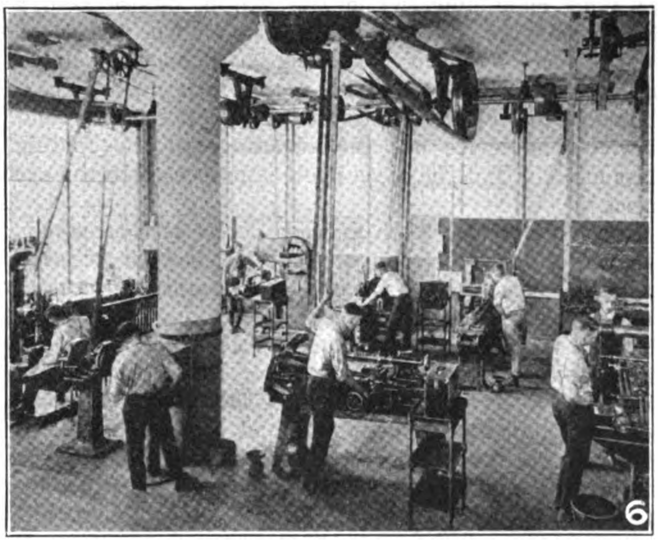


FIG. 5. TEST FOR FILING FLAT. FIG. 6. THE SCHOOL SHOP

a boy not only to draw, but to teach him to think. For this purpose the instructor has prepared many plates of parts known to the boys, but incomplete as to procedure and detail. This forces the boy to ask questions.

In some cases the blueprint which is to be used is marked with a warning to watch for wrong projections or incorrect dimensions. The method forces the boy to be resourceful and at the same time prevents him from becoming a mere copyist. For the purpose of making the boy think for himself much original work is required. For example, he is given a blueprint and information for a tie rod sleeve. After he has completed this drawing he is asked to draw a fixture to hold the sleeve in a milling machine. Again he is given a plate showing a projection of a center crank which he is supposed to draw, and this is followed by a request to make a double-throw crank from the same data given and then following this, a three-throw crank of 120-deg. centers.

Toward the end of the course, boys are required to produce drawings that conform to usage and standards, as used by the Government at this arsenal, and the so-called "Green Book" of instructions, used by the Government, becomes in part a text book of the school.

Special Devices Used

There are some devices used here as aids in teaching that might be considered special, if not unique, as the writer has not seen them used in any other school of this kind. A particular case is the method of teaching the use of the slide rule. A large rule, 8 ft. long, having numbers and graduations large enough to be seen across the room, is screwed to the wall as shown in Fig. 2. This rule not only answers the purpose of instruction but becomes a tool for the student as well, having the advantage that the instructor is able to see at a glance and from a distance, just how the user proceeds with the problem at hand.

Another unusual device in use is one that might be called, in a mechanical drawing course, a "view determinator." This device, along with the standard drawing showing the system of projections, is illustrated in Fig. 3. It is made to represent the form of a square tin pan, the top view of which is rectangular in shape, while the sides are given an even curve down to a flat rectangular bottom. The effect is that if an object is placed within the pan and then pushed to the right on the right-hand side, while the pan is before you, a right-hand view of the piece will be shown, and so on for the rest of the view, i.e., the left-hand view, upper and lower views, except the rear which must be explained, as it takes its place at the left of the left-hand view. This device has the advantage of the folding glass cube in that the piece itself is presented to the eye direct.

In studying gear teeth another device is used which, like the slide rule, is an attempt to show on a large scale the forms of the different kinds of gear teeth used. This device, as seen in Fig. 4, is nothing more than sections of large gears made to rotate about centers that would otherwise be the centers of the shafts to which the gears would be fitted. These sections have only the pitch lines, addendums and dedendums shown and are used in very much the same way as the teacher in the grammar school teaches geography with a map on which the names of the rivers and cities are left off. The student, from the models shown, is required to give the kind of gear, the diametric pitch, the circular pitch, the pressure angle, etc. Experience has taught the writer that the matter of interference is best taught by itself, and is best explained in connection with the different forms of teeth, and is partly brought out in connection with the stub tooth model.

Another device that is claimed to be original is for indicating the amount of deviation a boy makes from a perfect plane while filing a flat surface, and is shown in Fig. 5. It consists of a frame that is held in the vise and in which a flat piece of stock is held between centers. Near the end is a long pointer pointing to a graduated scale having a zero mark at what would indicate a level with the plane of the stock.

As the left hand is extended beyond the center line the weight of the hand tends to hold the file hard at the outer edge of the stock; also the opposite effect is produced when the right hand is farthest away from the center. The real value of the device is to show to what extent the boy is in error and also shows how few there are who are able to use the file and at the same time keep the pointer at the zero mark.

A vestibule machine shop, Fig. 6, is provided with standard machines—shapers, planers, milling machines, drilling machines, etc. Here the student receives first hand instructions in the use and care of machines; is instructed regarding the feed and speed of them and is given minor parts to manufacture. From time to time students are sent into the shop for observation purposes and when advisable they are given production work.

The following schedule is used on machine-shop work:

First Year		*Second Year*	
Machinists' helper	2 mo.	Slotting machine	1 mo.
Steel room	1 mo.	Smaller shaper	1 mo.
Toolcrib	2 mo.	Bench work	2 mo.
Drilling machine	1 mo.	Planer	2 mo.
Plain milling machine	2 mo.	Hardening and annealing	2 mo.
Small engine lathe	4 mo.	Tool grinding	2 mo.
		Erecting	2 mo.

Third Year		*Fourth Year*
Large lathe	2 mo.	General Shop Work, or a twelve months' review of the first, second and third years.
Universal milling machine	1 mo.	Note.—The apprentice will not be held on one line of work more than one month.
Gear cutting	1 mo.	
Boring mill	1 mo.	
Turret lathe	1 mo.	
Millwright	1 mo.	
Large shaper	1 mo.	
Large slotter	1 mo.	
Millwright work in assembling	3 mo.	

Fifth Year			
Die sinking	1 mo.	Physical laboratory	1 mo.
General toolroom work	2 mo.	Chemical laboratory	1 mo.
Smith shop work	2 mo.	Planning room	2 mo.
Foundry	2 mo.	General shop work	1 mo.

Several instructors are in constant touch with apprentices in the shop, giving instruction on the manufacture of parts used for regular ordnance material. This work is then submitted and ratings made accordingly.

The rate of pay for apprentices, for the year 1920-1921, was as follows:

1st period	$2.08 per day	5th period	$3.44 per day
2nd period	2.24 per day	6th period	3.76 per day
3rd period	2.64 per day	7th period	4.24 per day
4th period	2.96 per day	8th period	4.56 per day
9th period, 5th year	5.12 per day		

The results obtained from using apprentices in the shop after graduating have been very satisfactory. The boys are considered very high grade mechanics. Several apprentices have become assistant foremen, toolmakers and experts on experimental work.

It is entirely up to the boy to take advantage of the opportunities given, as the schooling and instruction as given at the Rock Island Arsenal are of the best that can be given in any special purpose or technical school anywhere, and the arsenal is very proud of its purpose and its accomplishment.

Wear on Various Automobile Gear Steels

Results of Tests Showing Wear Due to Difference in Quality of Material Heat-Treatment and Shape of Teeth—A Tooth-Profile Indicator

By E. R. ROSS
Experimental Engineer, Warner Gear Company

THE purpose of gears is to transmit power at different speeds, efficiently, quietly and with maximum life. To do these three things two additional considerations must be taken into account; namely strength and wear, the latter being the more important. If the gear tooth is made of suitable material and of such proportions as to minimize wear, generally speaking the tooth will be amply strong.

Quoting R. J. Chapman in his article "Research Work on Gears Needed," which appeared in AMERICAN MACHINIST, July 1, 1920: "Success in designing gear drives to operate satisfactorily under specified conditions is very largely a matter of appreciation of what has been done before under very similar conditions. The Lewis formula, being a formula for strength only, is of no assistance in selecting the most suitable combination of pitch, diameter, face width and material for the purpose. Experience can only determine these proportions, because, even though the gears be made to a fine degree of accuracy, and be capable of transmitting the load without tooth breakage, it does not necessarily follow that they will be satisfactory in operation.

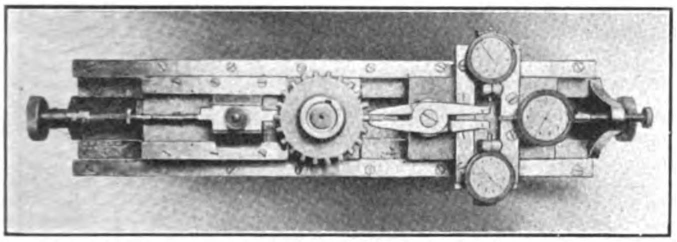


FIG. 1. SPECIAL INDICATOR FOR DETERMINING WEAR

"Further investigation should be made to establish reliable data relative to the various factors that determine the smooth operation and life of gear trains. The research could be divided into three classes. The work in section one would be to establish the most suitable material for use under given conditions, the allowable stress, the allowable pressure, the resistance to abrasion, the elasticity and such things being found for different materials. Section two would deal with methods of manufacture, and an attempt would be made to define the degree of error permissible with various grades of workmanship. Research in section three would determine the influence upon life and quiet operation of gears of such variables as peripheral velocity, load per unit of breadth, number of impacts, ratio of reduction, grade of workmanship, heating, and the disposition of metal in the gear rims and arms; methods of gear mounting to absorb vibration, and the lubrication of gears would receive attention.

"It will be agreed that successful research along these lines would provide dependable data for the design of gears to meet any conditions in regard to load, speed, quiet running, life and such points. Alone, the Lewis formula can be used only to ascertain the maximum permissible load to insure freedom from tooth breakage. With many gears this is the only point checked by the gear designer, with the result that they are transmitting excessive pressure, so that backlash and noise develop in a very short time."

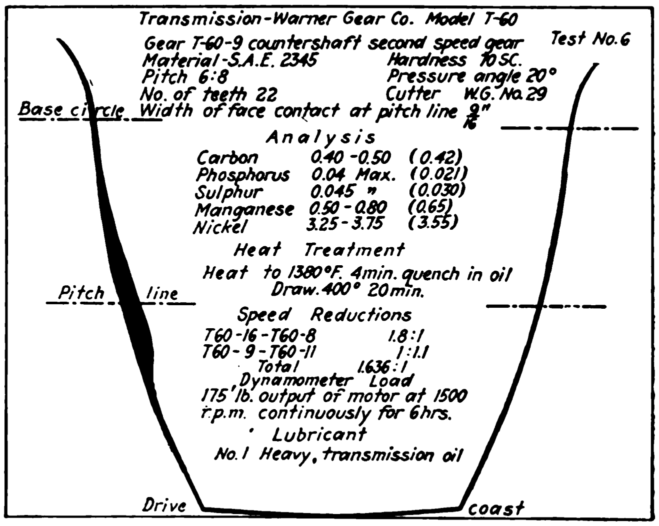


FIG. 2. WEAR OF A COUNTERSHAFT GEAR

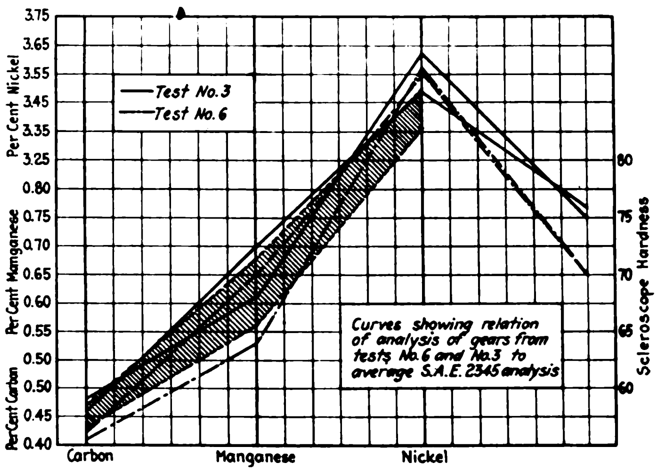


FIG. 4. ANALYSIS OF STEELS USED

Mr. Chapman in this article not only placed a very just criticism, but has gone a step further in that he suggested the line of procedure that must be inevitably followed if gears are to maintain the important position they now occupy in the automotive and allied industries in the transmission of power. With this outline before us in compiling the data of our tests, we have attempted to solve some of the most important problems that face the gear manufacturer today.

The work we are now doing has been confined largely to the selection of materials best suited for the purpose

Paper presented at the Rochester meeting of the American Gear Manufacturers' Association.

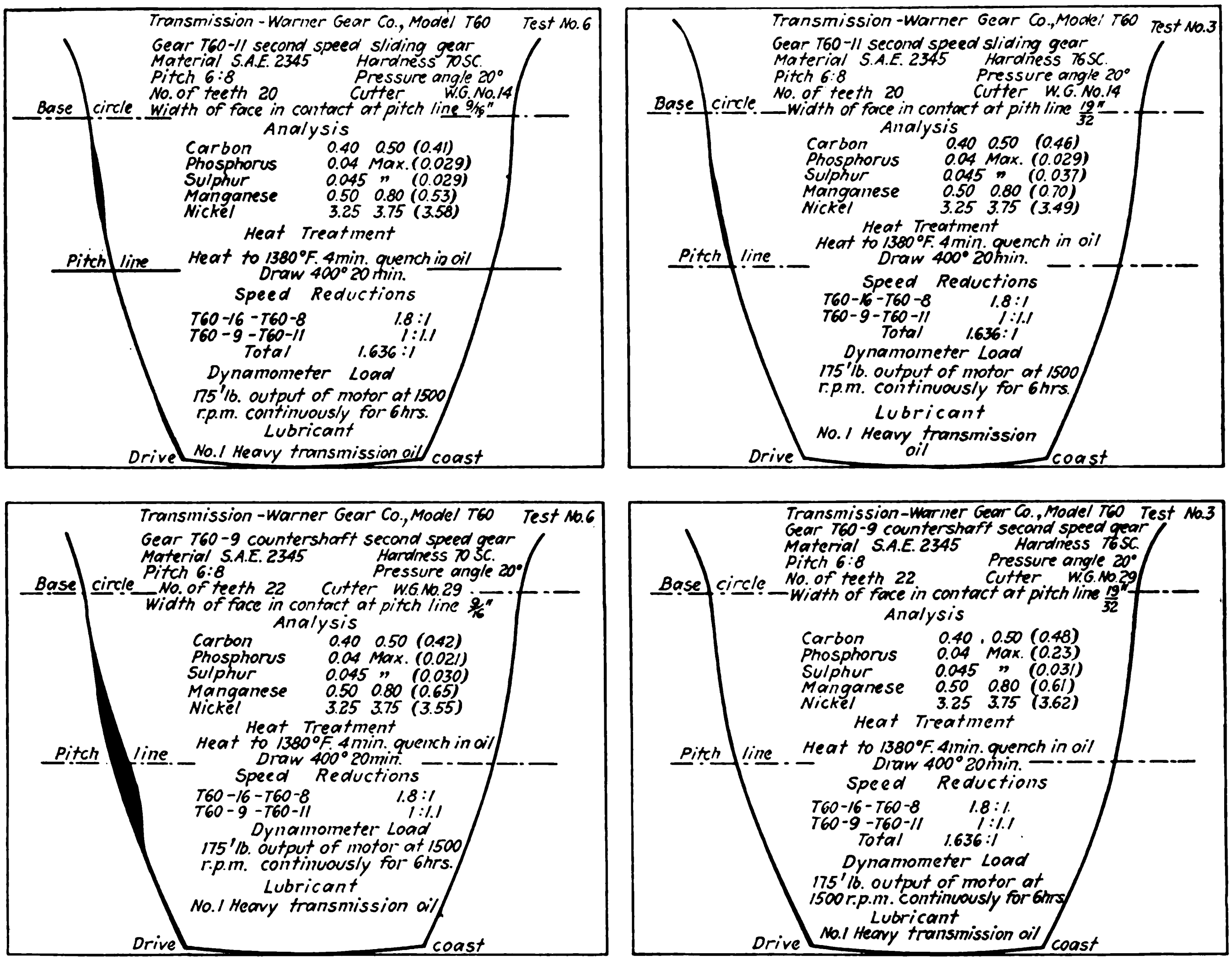


FIG. 3. WEAR OF GEARS OF DIFFERENT HARDNESS

of automotive transmission gearing, the selection being upon the basis of resistance to abrasion or wear.

Two standard transmissions were used which were checked over very carefully to assure us that we were not risking a possibility of error in our results by confining our tests to one transmission. Satisfying ourselves upon this point we proceeded with the test by alternating the two, preparing the one while we were testing the other. All parts were checked carefully after tearing down the transmission, likewise all new parts were carefully checked before assembling.

The transmission carries 6-8 pitch gears having ⅞-in. face and is well adapted to the needs of a medium weight and medium powered passenger car or light-weight truck.

The test was run upon the material used in the second speed gears, or the third and fourth of a train of four gears. This selection was made on account of being the most used of the speed reductions in passenger car service, also on account of the difficulties presented in the manufacture of a sliding gear with internal clutch teeth. It is frequently used with a very high percentage of the full motor torque. These are also "clash gears" and accordingly a portion of the face width which they otherwise would have, has to be sacrificed in rounding the corners upon one end of the teeth to assist in meshing the gears. They have a combination of a higher pitch line velocity than the other reductions, together with a correspondingly lower maximum torque.

In order that we might duplicate the conditions of each individual test with those of any other test of the series, constant torque and constant speed were the first considerations. In order to accomplish this standand, dynamometer equipment was used.

To be able to properly and impartially classify our results, it was necessary that very careful measurements be taken of both the new and the worn tooth. To do this, we developed a tooth profile indicator, Fig. 1.

The gear is mounted upon a stud in the center of the instrument. At the left and pressing against the top and side of a tooth is a stop which is held in this position by the spring behind the block. This holds the gear rigidly in position. Diametrically opposite this stop on the gear there are two fingers carrying points over the edge or profile of the tooth. At the right are two dial indicators, one for each of these points which operates through a 1:1 lever. To the right and in the center is a third dial indicator used to determine the depth or distance in from the point of the tooth to the points of the indicating fingers. The indicating fingers carry knife edge points so that the readings upon the leverage of the fingers do not change from the 1:1 ratio and at the same time making the readings upon the indicators a true indication of the contour of the gear tooth.

In Fig. 2 is shown a plot of the countershaft gear of test No. 6. The shaded portion of the tooth is the amount of metal that has been worn from its face,

showing the location with reference to the pitch line and base circle. The point of maximum wear upon this gear was 0.012 in. deep and from 0.010 to 0.020 in. above the pitch line.

Since the wear is often unequal and we are unable to predict before the test just where it will be greatest, we select for measurement the tooth that shows the most wear. Fortunately the chamfered end of the mating gear leaves an unworn portion which can be measured after the run, enabling us to compare it with the worn portion of the same tooth. The plot is a comparison of the original outline with readings taken in the center of the worn portion of the tooth.

The Gear Tested

Covering the various items as they appear printed upon the chart, this plot is from the countershaft second speed gear, the material used in this test was from S.A.E. No. 2,345, having a hardness of 70, scleroscope. The gear was 6-8 pitch and 20 deg. pressure angle, having 22 teeth and was cut by our cutter No. 29. The tooth had a 19/32-in. width of face in contact at the pitch line. The analysis given with limits is the standard specification for the material used, the values in parenthesis are the values by actual analysis of this gear. The heat-treatment given this set of test gears was a heat to 1,380 deg. F., followed by quenching in oil and drawing in oil at 400 deg. for 20 min. The speed reductions are: From the main drive gear to the countershaft drive gear, having 15 and 27 teeth respectively (27:15 or 1.8:1), the countershaft second speed gear to the second speed sliding gear, having 22 and 20 teeth respectively (20:22 or 1:1.1), making a total reduction of 1.636:1. A 50-hp. load was applied to the transmission by the motor dynamometer (175 ft.-lb. torque at 1,500 r.p.m.) continuously for 6 hours.

At such a motor speed 175 ft.-lb. represents an overload for this particular set of gears quite beyond anything to which they would be subjected in actual service. Preliminary runs demonstrated, however, that some such overload was necessary if we were going to have any measurable amount of wear in a test of reasonable length of time. The six-hour test would represent, in a car having 32-in. wheels and 4¼ to 1 axle ratio, running in intermediate at a speed of 19 miles per hour for a total distance of 114 miles. The transmission lubricant used was an oil designated as No. 1, heavy.

The test was conducted by holding the power output (speed and torque) of the motor dynamometer constant for the six hours, readings being taken of oil temperature, mechanical efficiency and room temperature at one-minute intervals for the first five minutes, the same readings taken ten minutes after the start of the test and by ten-minute intervals thereafter till the end of the test. The same amount of new lubricant was placed in each transmission when set up for test and not changed during the test.

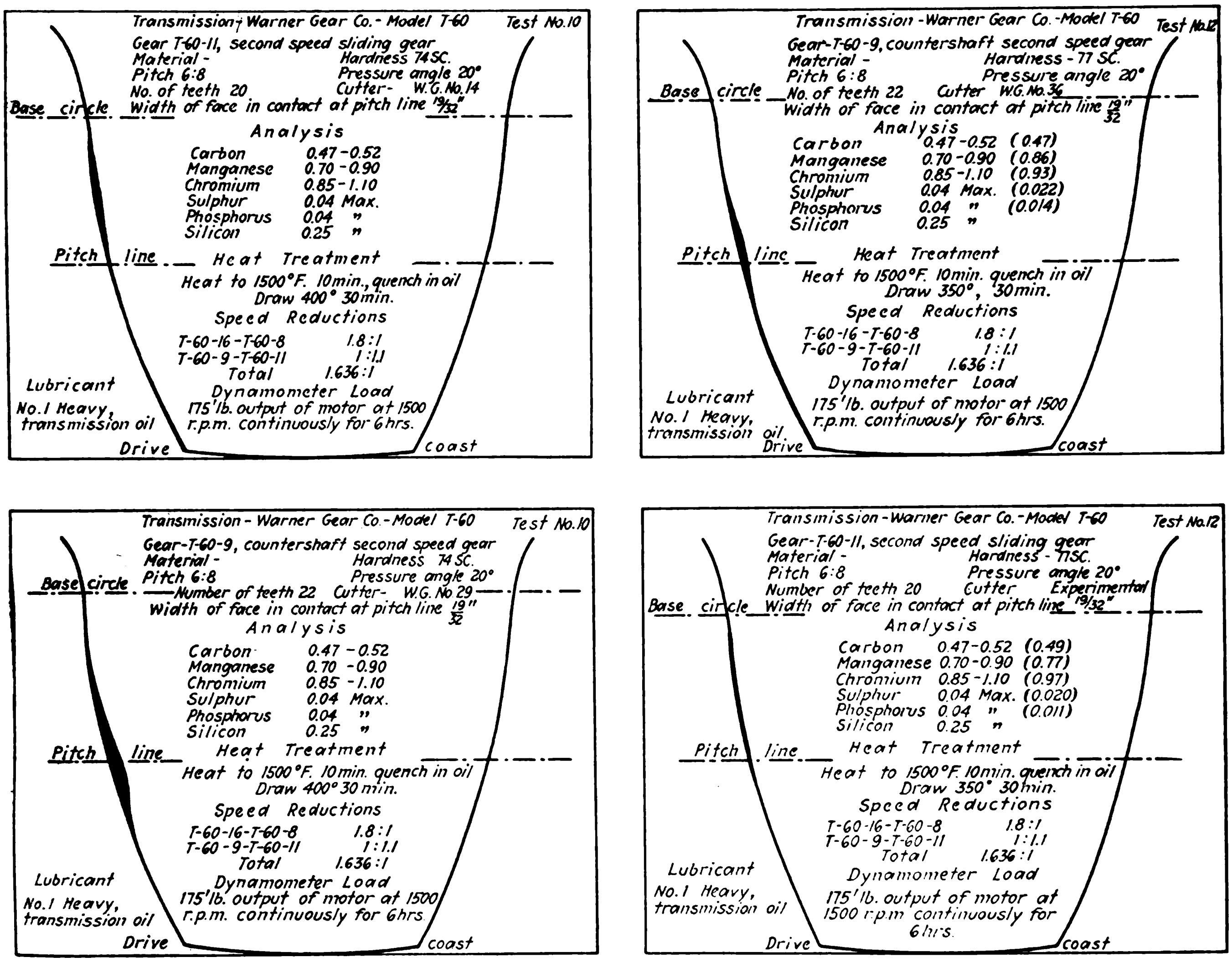


FIG. 5. EFFECT OF PROPER TOOTH FORMS

Fig. 3 represents two tests showing the best and worst conditions of wear on the oil-treated gears tested. You will note that they are both of S.A.E. No. 2,345 steel heat-treated in the same manner and cut by the same cutters, but test No. 6 (shown at the left) has a scleroscope hardness of 70 on both gears, while test No. 3 (shown at the right) has a scleroscope hardness of 75 on the countershaft gear and 76 on the sliding gear. Note the variation in the analyses of these gears, also the relation existing between the carbon content and the amount of wear. In the latter connection the wear is greatest upon the driving gears, even though it may contain slightly greater carbon. This is a condition which we would expect when the action of the gears under load is analyzed.

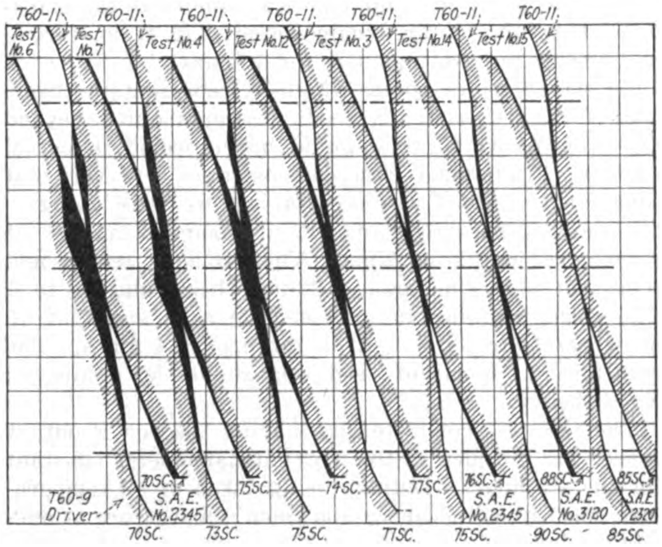


FIG. 6. EFFECT OF HARDNESS ON WEAR

If the gear action were ideal, the two gears would have no backlash and any movement of the driving gear would have a corresponding movement of the driven gear. In gears as cut, there is a certain amount of backlash to accommodate lubrication, slight inaccuracies in the cutting of the teeth and warpage from heat-treatment. Any increase of backlash due to wear permits an uneven or slightly intermittent velocity to exist, which once started, rapidly destroys the contour of the tooth. This action is more rapid upon the driving gear due to its having to absorb variations in load and velocities resulting from the breaking down of the curvatures of both the driving and driven gear.

Importance of Proper Cutters

In order that we may get a representative test of the wearing properties of the steel and not a premature breaking down of the tooth curvature due to intermittent velocities or interferences, great care must be exercised in the selection of the cutters used upon the gears to be tested, also upon the other gears in the train under load at the same time. In order to eliminate all possible variation of the load being transmitted through the first pair of gears in the train, new gears were used for each test. The heat-treatment used on these gears was limited to either that recommended by the manufacturer of the steel, or that found by experience best suited to the steels used.

As a result of 325 separate analyses of S.A.E. No. 2,345 we secured a fairly representative idea of the average analysis of the steel with regard to carbon, manganese and nickel. We found that the carbon averaged between 0.43 to 0.47, the manganese from 0.56 to 0.68, and the nickel from 3.36 to 3.50 per cent. The S.A.E. limits are so wide upon this steel that it is difficult to get uniform structure from a common heat-treatment in quantity production.

In Fig. 4 is given the analysis of the S.A.E. No. 2,345 steels used in tests Nos. 6 and 3, as shown in Fig. 3. The average analysis is shown as the shaded portion between the dotted lines. The gears of test No. 3, which had the least amount of wear and the higher hardness show a higher carbon content, a higher average manganese and about the same average nickel as compared with the gears of test No. 6, which were more worn and softer. This will also be explained in a measure by the difference in the structure. The presence of more troostite in the gears having the low carbon may be accounted for by considering that when a heat is used that is correct for the steel having the higher carbon, it is not high enough for the one having the low-carbon content.

In the tests shown in Fig. 5, the gears are of the same material and have a difference of only three points in hardness. Here is very clearly illustrated the point mentioned before in the importance of using gears cut with cutters having as nearly correct outline as possible. The gears of test No. 10 were cut with the same cutters as were used upon the gears of tests Nos. 6 and 3, but from the time that the gears were cut for these tests until used for test No. 10, the cutter used upon the countershaft gear had cut 240 gears and had been ground eight times. The cutter used in cutting the second speed sliding gear had cut 142 gears and had been ground five times. This change in the cutter gave an interference which was noted before the gears were tested. When this condition had been removed by getting the proper curvature, the steel showed up very well, as will be noted by test No. 12.

Effect of Hardness on Wear

In Fig. 6 is shown an assembly of the driving and driven profiles of seven tests ranging from the condition of the most wear as shown by test No. 6 at the left, to the condition of minimum wear as shown by test No. 15. The driving gear is the one at the lower left of each combination. Here we may get some idea of the relation of the wear as compared to hardness, as well as the action of the wear and the different steps in its progress. You will note the small worn portion of the driving gear of test No. 15 at approximately 0.040 in. above the base circle and also the worn portion near the top of the tooth and the conditions in tests No. 12, No. 3, No. 7 and No. 6, as this action has progressed. The destructive action having moved from slightly above the base circle up toward the top of the tooth. When once this action has set in upon the faces of a gear, it progressively grows in intensity.

The tests of oil temperatures, mechanical efficiencies and room temperatures were also of interest. At the start of the tests the oil temperatures and room temperatures were the same and ranged from 60 to 80 deg. F. The oil temperature rose very rapidly for the first hour and had practically become constant at the end of two hours, the maximum conditions for oil temperatures on a test (not shown) was 370 deg. F. The mechanical efficiencies started with an average of 96 per cent and had practically become constant at the end of an hour. The average maximum efficiencies for the

tests shown were 98.7 per cent with a maximum of 98.9 per cent. This is a power loss of 1.1 per cent or 0.55 hp. for a 50-hp. load on this transmission. Properly constructed and properly lubricated, the automobile transmission is a very efficient unit.

The mechanical efficiencies had a gradual rise and a falling off shortly before the end of the test where the wear had been very great, but did not give any marked indication of the wear as is shown by the rise in oil temperatures which were practically without exception in proportion to the amount of wear as shown when indicated and plotted.

Considering that at this speed the tooth picks up its load more in the nature of an impact blow, especially when the tooth becomes slightly worn, we have another interpretation of the tests in the order the load is transmitted to each gear of the train as follows:

Order of gear in train	Number of teeth in gear	Speed in r.p.m.	Pitch line velocity, ft. per minute	Load at pitch line, lb.	Load in lb. per inch of face (assuming 9/16 in. face)	Total number of impacts on each tooth
1	15	1,500	982	1,680	2,986.66	540,000
2	27	833.3	982	1,680	2,986.66	300,000
3	22	833.3	800	2,063	3,667.55	300,000
4	20	917	800	2,063	3,667.55	330,120

From a careful study of the figures and curves, which are representative of the tests we are making on steels for gears, we would recommend for oil-treating steel that it possess a minimum analysis of 0.45 per cent carbon; be capable of treating to obtain a scleroscope hardness of 75 or over without brittleness; that it be as clean as it is commercially practical to make it, and that the specification limits of the analysis be of close enough range to insure uniform results from a standard heat-treatment.

Letters from Practical Men

By F. P. Terry

The accompanying letter is from an old reader and contributor in Belfast, Ireland. He has stated the case clearly; the American Machinist does want letters from practical men—not pipe dreams or pot boilers—but honest-to-goodness experiences of men who have done some unusual job, or a usual job in an out-of-the-usual way. We hope Mr. Terry's experience as given below will inspire others to follow his example. [Editor.]

On the editor's page of the American Machinist (444, Vol. 55) it was stated in connection with the contributions under the above heading, "If they do not measure up to your standards, why not send in what you consider good ones?"

After reading these letters, I am fully satisfied that they are good, and I think that what the editor is getting at and what some of us want, is more of them.

During the twenty-five years that I have been a reader of the American Machinist, I have always enjoyed the letters from practical men, more so, of course, if a contribution of mine appeared therein, and I have often thought that these letters would, like Tennyson's "Brook," "go on forever" without becoming stale or uninteresting and that the practical machine shop man would always insure a busy time for the editor in making a selection. If the opposite is the case now, it is greatly to the discredit of the practical man and is very difficult to explain.

Perhaps some are keeping their ideas to themselves with the notion that they are so much wiser than the rest of the machine shop world. Sometimes this is better known as "swelled head," and if any reader has symptoms of this complaint, there is nothing better than trying to write letters for the practical column to reduce his head to normal. With this type of reader there is every chance of a complete recovery if the course is once started, but there is very little hope for another type known as the "grab-all." He is easily recognized by the shifty eyes that look at you always with suspicion that you are robbing him, or going to, at the first chance. He reads all he can but never tells you about it because he is afraid you might get a little information, which, like everything else he has, is never given away. This type is hopeless and can be left to go down unhonored and unsung.

There is yet another type with which we can all sympathize and offer encouragement. I refer to the practical man who fears to put his ideas into print. His modesty is often his undoing in the machine shop. He sees others going ahead, while he remains in the same old groove, and he is put down as lacking initiative when it is only shyness, which, if overcome, would change his whole outlook in life. To this type I would also advise the writing of letters on practical subjects.

Always a Place for Ideas

Many men are convinced that their contributions will be refused because they are poor draftsmen and scholars, and, if they got anything published, it would only show up their shortcomings. This is an entirely erroneous idea. The American Machinist never will let you down or show you up, and, although all editors like nice things, it does not matter how rough the case if the "goods" are inside, and hundreds of men can testify that this interesting hobby has made them better writers and better draftsmen, has assisted them to better positions and improved their standing in many ways and last, but not least, has put many dollars into their pockets.

Perhaps my own case may start some faltering brother along this interesting road. My first contribution brought in one dollar. The small sketch took me several hours, as I was a poor draftsman. Today I could make a better freehand sketch which would take about five minutes. I can also do a bit at the board, the desire to be able to draw having been created by the American Machinist. Thanks also to the same source, I got the desire to possess and read all the histories I could get about old engineers and old tools, and today I have a bookcase fairly complete which has brought me more than twenty times the cost. Since my first attempt at writing when I was a young journeyman, I have passed through all stages in machine shop control up to getting a business of my own. During this time I have kept on writing, and for several years the American Machinist's monthly check arrived as regularly as my salary. A few photographs and one evening's work brought me in fifty dollars; I have also made friends all over the world.

There is no reason why any reader should not do the same. Why not start now?

Eliminating the Hit and Miss Method of Hiring Men

By F. T. MacFeely

There was a time when the first man who came along got the open job, providing he wasn't totally blind or a hopeless cripple. It made no difference whether or not the applicant was fitted for the work for which he was employed; if the first impression was favorable to the superintendent or foreman who did the hiring, the man was set at work without further ceremony. This method of hiring men is no longer used at our plant, but has been discarded for a better one. Now each man is interviewed thoroughly, to determine his qualifications and to fit the right man to the right job.

This is accomplished through job specifications. The form shown here is the one we use. There are others which are no doubt just as good, but this one fits our requirements better than any others we have tried.

As will be seen, it is divided into five sections, one giving general information, the second stating the requirements of the worker, third the physical aspects of the job, while the last two are left blank for the convenience of the interviewer.

The blank forms are applicable to all departments of our factory. They are completed in accordance with the form, shown herewith, from information obtained at a conference between the interviewer, the superintendents and the foremen. First, the foreman and the interviewer get together and decide on the requirements and qualifications for each occupation in the department, after which a copy is sent to the division superintendent for his approval. If he takes exception to any items, he calls in the foreman and interviewer for a consultation.

It is no easy matter to get one of these forms properly filled in, as the wide difference of opinion as to the requirements for some occupations necessitate much thought and study. The foreman and interviewer may agree on certain qualifications, but the superintendent's ideas may be quite different. The job specifications are worthless without the positive agreement of all three persons concerned, but when they are once completed satisfactorily they are worth many times the trouble and expense involved.

We have found these job specifications, or "hiring specifications," as they might be called in our case, among the most valuable records we have in our employment department.

JOB SPECIFICATION

General Information:

Occupation *Engine Lathe Operator* Dept. *Machine*
Duties *Machine Brass, Mall. and Iron Castings on Engine Lathe*
Tools Required *See attached list*
Furnished by Company *Attached list* By Employee *Attached list*
Experience Necessary *Drill and Turret Lathe* How Long to Learn 1 *Year*
Start Rate *M F* Max. Rate *CFX* Promote from *Turret Lathe* To *Tool Lathe*
Day Work X Piece Work Bonus Combination

Requirements of Worker:

Man X	Age Limits Desired 20–40	Set up Work X	Quick
Boy	Age Limit Acceptable 20–50	Read Scales X	Deliberate X
Tall	Weight—Maximum	Use Jigs	Patient X
Medium	Weight—Minimum	Use Templates	Careful X
Short	Read Micrometer X	Use Gauges X	Thorough
Strong	Read Blue Prints X	School Grade 8	Accurate X

Physical Aspects of Job:

Hand Lift X	Standing X	Floor	Dusty	Wet
Crane Lift	Sitting	Bench	Noisy	Dry X
Medium Hvy.	Stooping	Heavy	Acids	Hot
Variety	Walking	Light X	Fumes	Cold
Repetition X	Exacting	Close X	Quiet	
Monotonous	Indoor X	Rough	Alone	
Machine X	Outdoor	Dirty *Some*	Pairs	
Pleasant X	Greasy	Clean	Group	

Questions to Ask:

Can you cut threads without reverse belt or dial in carriage?
How would you bore a taper hole without taper attachment on lathe?

Remarks:

If possible, employ a young man for this position, one who is ambitious, as the opportunity for advancement is good.

Selling a New Gage to a Competitor

By Frank C. Hudson

It always pays to know your competitors and your competitors' friends.

One day in the early stages of our business we got an order from the Blank Company for one of our special gages which we had just announced. The first thing which aroused our suspicions was that it was a carte blanche order with no query as to price. Now this company had always been a very close buyer, with an emphasis on the "close." Furthermore, we knew that it was having a hard time to keep the sheriff's sign off the door, so that an order of this kind set us to thinking.

Then we saw the light.

Our worst competitor, not in real competition but worst in the worst way you can use the word, was a personal friend of the grand mogul of the Blank Company. So we knew at once why the gage was ordered. The Grabem Company wanted a chance to take one apart and copy it as nearly as possible in order to compete in bidding for a big order which had loomed in sight.

Did we refuse to supply the gage? We did not. We thanked the company for the order and proceeded to make a good instrument in every way. It would function properly and to all appearances was like our regular product. But it wasn't. It would do all the name implied but it lacked a couple of features which we knew would be specified in the order and was not like our regular product in many ways. The rest is easy to guess. The Grabem Company copied our instrument, as usual, spent some of their good money on tools and submitted an instrument which did not meet specifications.

We got the order. If we had sent one of our regular gages there's no telling what might have happened.

As I remarked before, it pays to know your competitors and who your competitors' particular friends are.

Automotive Service Methods and Equipment

VIII. Some Operations in a Standard Oil Company Service Plant—Ford Rear-Axle Tools—Turning Crankpins—Grinding Cylinders in a Lathe

By HOWARD CAMPBELL
Western Editor, AMERICAN MACHINIST

SOME of the tools in use at the Chicago service plant of the Standard Oil Co., at 14th and Leavitt Sts., will undoubtedly be interesting to those engaged in work of a similar nature.

The operator shown in Fig. 1 is removing an axle housing cap from a Ford rear axle. The method of

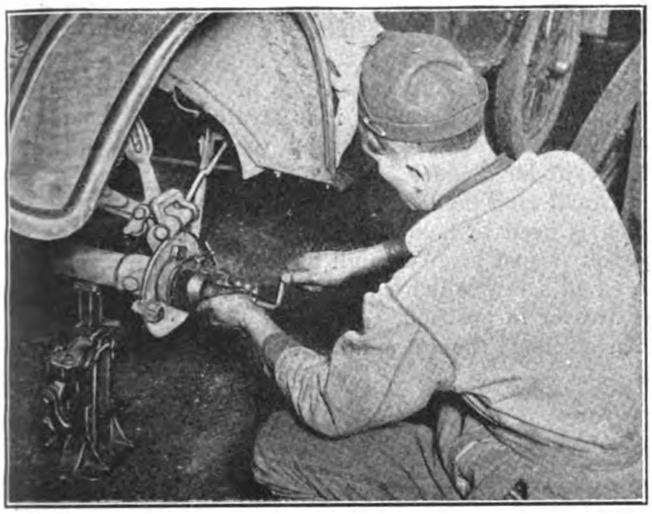


FIG. 1. PULLING OFF A FORD AXLE HOUSING CAP

using the puller can be seen at a glance, while the details of the tool used are shown at *A* in Fig. 3. The wheel is removed from the axle as shown in Fig. 1, and the puller applied over the cap. Then the screw *C* is turned, shoving the key *D*, which has a slight lip at the end, in through a slot so that the lip catches over the inner end of the cap. Then the crank *E* is turned, the screw of which it is a part feeding in against the end of the axle shaft, thus drawing the body of the tool, with the axle housing cap, off the shaft.

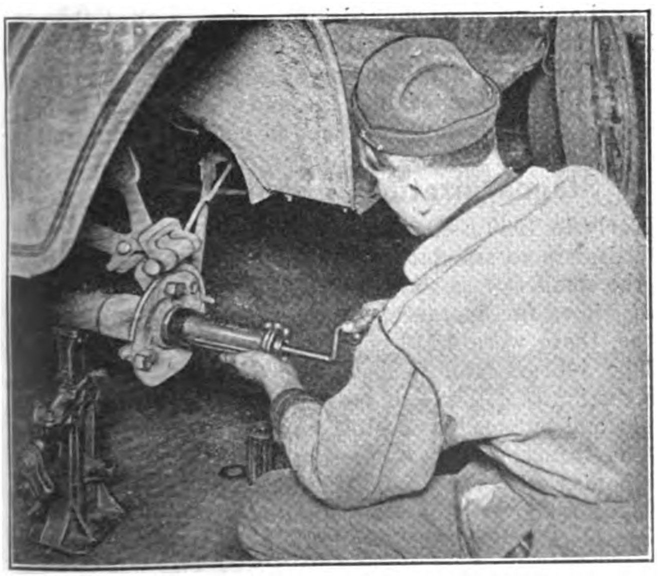


FIG. 2. PULLING THE ROLLER BEARING SLEEVE FROM A FORD REAR AXLE

In Fig. 2 is shown how a roller-bearing sleeve puller is applied. This tool, which is shown at *B* in Fig. 3, is inserted into the axle housing, and slips into the roller bearing sleeve. The pin *F* which is operated by the handle *G*, is connected to the pin *H* through an eccentric so that when the handle is turned, the pin can be made to recede until it is flush with the outside diameter of the tool, or it can be made to protrude.

There is a hole in the roller bearing sleeve through which grease is fed to the roller bearing. When the sleeve puller is in place, the handle is turned so that the pin protrudes, and the tool is turned until the pin slips into the grease cup hole. Then the sleeve can be removed from the housing by turning the crank *I*, which feeds a screw against the end of the axle shaft.

The test fixture shown in Fig. 4 is of simple design, but does the work required of it very nicely. The pin *A*, which is the exact size of a Ford crankshaft, is slipped through the large end of a connecting rod, as shown. Pin *B* which is the size that a piston pin should be, is inserted in the small end of the rod. When the rod is in the position shown, if a heavier feeler can be slipped under one end of the pin than under the other end, it is obvious that the piston-pin hole is not parallel with the crankshaft hole. To test the rod for twist, it is simply swung over until the pin rests

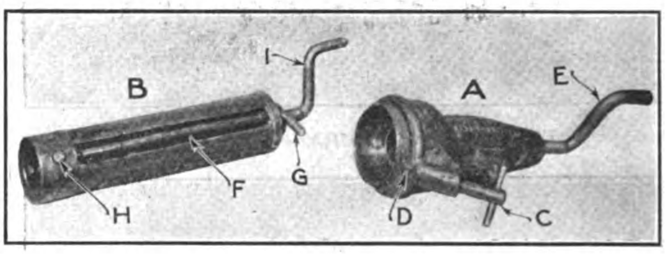


FIG. 3. AXLE HOUSING CAP PULLER AND ROLLER BEARING SLEEVE PULLER

on the blocks indicated at *C*. Any twist can be detected immediately by the use of the feeler gage.

A pair of clamps which make it possible to turn the throws on any crankshaft is shown at *A* and *B* in Fig. 5. The hole in the clamp is large enough to receive the end of the shaft, which is held in place by the setscrew *C*, as shown. The centers of the lathe fit into the sliding blocks, one of which is shown at *D*. This block is turned and threaded on the end opposite the center hole, to receive nut *E*, which is screwed down to hold the block in place.

The blocks are set as nearly in line with the pins to be turned as possible, before the shaft is put into the lathe. Then an indicator is used to finish the job of lining up, the blocks being adjusted until the pin is running true, after which the turning can be done.

To obtain the best results in working on crankshaft pins, a counterweight should be used as shown at *F*. Otherwise the weight of the shaft itself will spring it "out of true" as it turns.

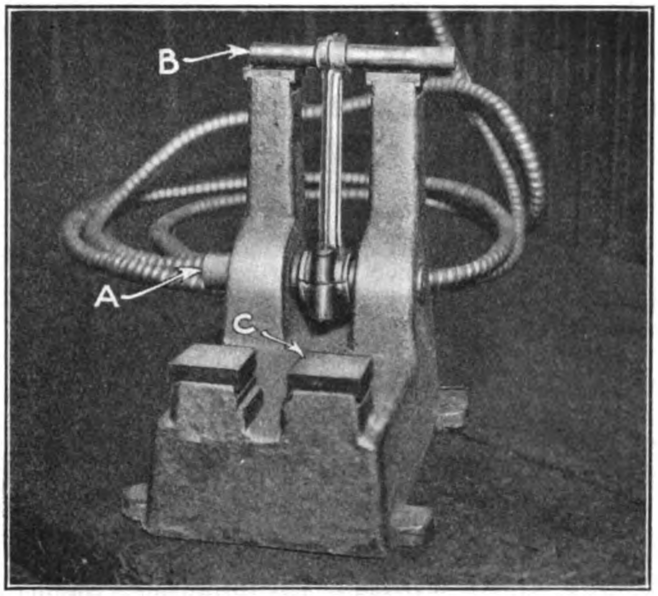


FIG. 4. FIXTURE FOR TESTING STRAIGHTNESS OF CONNECTING RODS

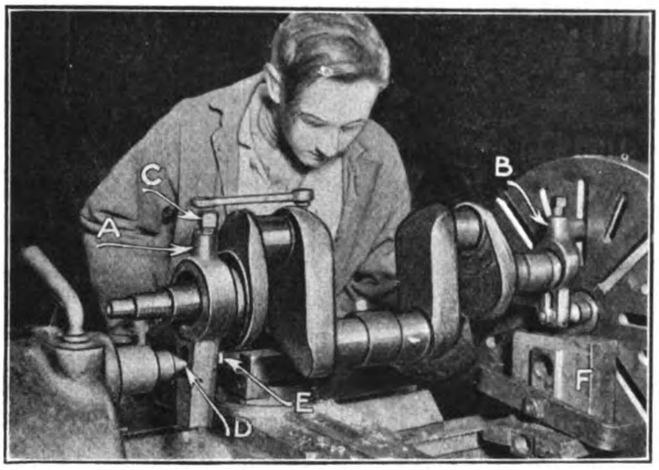


FIG. 5. TURNING CRANKSHAFT PINS

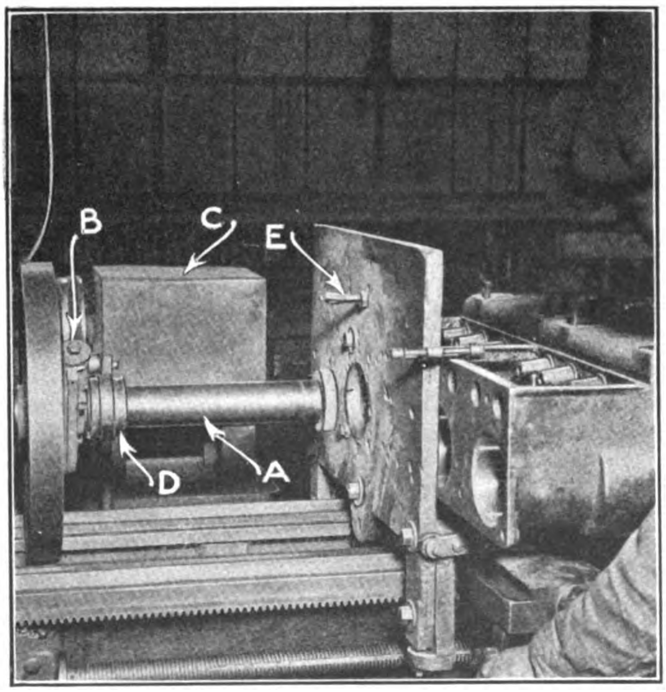


FIG. 6. GRINDING CYLINDER BORES ON A LATHE

The operation of grinding cylinder bores on a lathe that has been converted into a cylinder grinder is shown in Fig. 6. The grinding attachment, as can be seen, is bolted to the faceplate. The sleeve *A*, to which the wheel is attached, runs on ball bearings on a shaft which is attached to a sliding head. This head is dove-tailed and gibbed into the plate that is bolted to the faceplate of the macihne. The shaft can be adjusted to the amount of eccentricity required by means of the screw *B*. Power is supplied through a 1 hp. motor which is covered by the box *C*, by belt to the pulley *D*, which is a part of the spindle. The wheel is a "grade 46," furnished by the Heald Grinder Co. expressly for cylinder grinding.

The speed of the faceplate is about 15 r.p.m., and that of the wheel is about 4,000 r.p.m. This spindle is furnished by the Acme Grinder Co., Minneapolis, Minn.

The cylinder is bolted to the angle plate which in turn is bolted to the cross-slide of the machine, and the bore is indicated until it is straight and true with the spindle. Then the operator proceeds as with any other cylinder grinder.

A small ring bolt is screwed into the faceplate at *E*, which is used to hold the wheel dresser. The hole in the bolt is just large enough to receive the dresser, and the small screw which can be seen in the picture holds the dresser in position.

An efficient, though simple, tool is shown in Fig. 7.

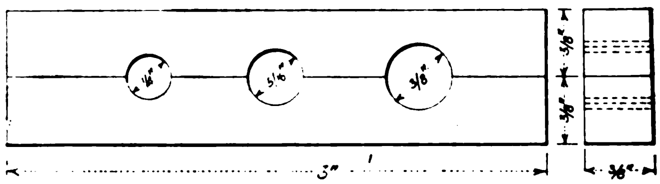


FIG. 7. TOOL FOR FLANGING COPPER TUBING

This is composed of two straight pieces of ⅜-in. square cold-drawn steel, with three holes drilled in the two pieces as shown, so that each piece contains only one-half of each hole. The holes are ¼ in., 5/16 in. and ⅜ in.

When it is desired to put a union or coupling on one end of a piece of copper tubing, the coupling is slipped over the end of the tubing, then the end of the tubing is caught between these two pieces of steel, the size of the tubing determining the size of the hole to be used. Then the pieces are clamped into a vise so that the end of the tubing sticks up above the steel blocks about ¼ in. One blow of a hammer on a round nosed punch that has been inserted into the end of the tubing puts a flange on the tubing sufficient to hold the coupling.

Standardization of Shotgun Shells

Early in 1920 a campaign was launched with jobbers and dealers to standardize on and restrict their orders to the smallest necessary number of shotgun loads. At that time, for instance, in 12 Gage smokeless loads alone, there were 4,213 combinations.

The jobbers and dealers responded readily to the suggestion that the loads be reduced to a common sense basis and suggested possible eliminations.

The information was passed on to the ammunition companies with the result that in the 12 Gage smokeless loads 85 per cent were eliminated and 72 per cent of the black powder 12 Gage loads were eliminated. The same proportion holds good all through the list of loads in all gages.

Shafts Weakened by Grinding Cracks

By K. Heindlhofer

Causes which appear insignificant and escape general attention oftentimes produce serious results. This is illustrated by an experience on hardened and ground shafts, two of which broke in succession at a load considered to be within the safe limit. Due to the fact that the acting forces and running conditions were well defined and known, a record of this incident may be of interest to both the shop and engineers.

The shafts which broke were made of a 1 per cent carbon, 1.5 per cent chrome steel of high quality. They were heat-treated, which resulted in a hardness of 600 Brinell. The shafts were ground to the dimensions shown in Fig. 1 and carried four ball bearings equally spaced at a distance of 3.8 in. The two inner bearings carried a vertical load of 4,550 lb. each. Practically no torque was transmitted. Due to the equal spacing the outer bearings furnished an identical reaction load. The maximum stress due to bending was 31,800 lb. per square inch. The speed of rotation was 1,450 r.p.m. A revolution counter indicated the total revolutions of the shaft.

The first shaft broke after 195,000 revolutions or 2¼ hr. A second shaft, which was made exactly the same as the first, met the same fate after 10,000 revolutions or less than 7 min. This was a surprise, as smaller size shafts under similar stresses, had given continuous service.

After the second shaft broke both failures were closely investigated. The investigation revealed the presence of grinding stresses and cracks, due to excessive pressure of the wheel when grinding the shaft. In both cases the fracture started at the defective surface. The pressure of grinding was caused by a hump in the shafts, which were warped in quenching. Fig. 2 is a photographic reproduction of the cracks in both shafts. The cracks were rendered visible by deep etching in boiling 50 per cent hydrochloric acid.

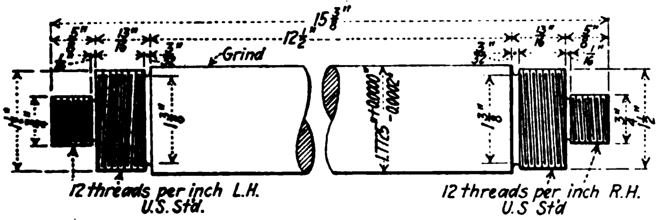


FIG. 1. DIMENSIONS OF THE SHAFT

The third shaft, which was identical in dimensions, material, and heat-treatment, with its foregoers, was ground with care under small wheel pressure. It was then put in service and has made 57,484,000 revolutions, which corresponds to a 660 hr. run. It is still in perfect condition, in spite of the fact that it ran under the same load and speed as the first two.

The great difference in life of the shafts, caused by improper and proper grinding, shows the evil effect of forced grinding. The forced grinding may render the piece useless, which fact may easily escape inspection, because even hair cracks are generally invisible to the eye.

To explain the failures recorded above, let me call attention to the behavior of a thick glass, into which hot water is suddenly poured. One would not be surprised to see the glass cracked after this experiment. Something similar happens in forced grinding. A hard wheel at excessive pressure will produce an instantaneous local heating on the wheel. The locally heated area will expand and produce stresses. In addition to the heat effect at high wheel pressure, considerable friction is created between the work and wheel which transmits tangential forces between the two. These forces act on a very small area, thus the unit tangential or shearing stress may reach a considerable magnitude. A combination of the heat and frictional stresses is, in all probability, responsible for the cracks. These cracks, if on the surface, are not very dangerous at steady load. Assume the shaft was not rotating but subjected to a constant load, no fracture would have occurred. It was stated above that the shaft broke after a certain length of time (2¼ hr. in the first, and 7 min. in the second case). The influence of the time to produce fracture is explained by the fact that the stresses on the top, caused by the bending, are opposite in direction to those on the bottom of the shaft. After each half revolution the compression and tension stresses reverse; thus at each revolution two reversals take place. It is a well known fact that alternating stresses cause fracture in the material even below the elastic limit. In this case no appreciable permanent deformation will occur, thus the local high stresses at the ends of cracks will not be reduced by permanent stretch such as would be the case on a still-standing shaft. Therefore, fracture will start at the cracks as soon as the metal is fatigued at these severely stressed points.

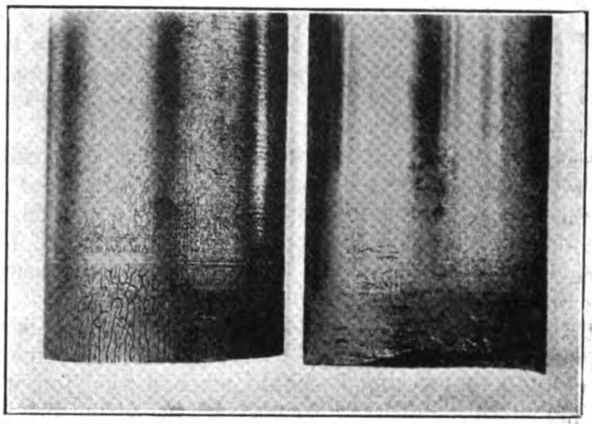


FIG. 2. THE CRACKS IN BOTH SHAFTS

Experimental Use of Liquid Air and Explosives for Tightening Body-Bound Bolts

Cylindrical and Taper Bolts Contracted by Liquid Air and Allowed To Expand After Insertion—Cylindrical Bolts Expanded in Place by Explosives

By H. L. WHITTEMORE
U. S. Bureau of Standards, Washington, D. C.

BODY-bound bolts are used in the Navy for attaching the lugs of turret guns to the supporting girder, and for other purposes. Taper bolts have been successfully used, but other possible means of securing the same results were made the subject of investigation and experiment.

The experiments described in this report, undertaken at the request of the Bureau of Construction and Repair, Navy Department, were made to determine the force required to cause slipping of a body-bound bolt. Two methods of obtaining a metal contact between a bolt and the material suronunding it were used.

Tests were made on bolts which had been body-bound by the following methods: (1) Liquid air, shrinking the bolt by immersing in liquid air and allowing it to expand in the hole; (2) explosives, inserting the bolt which was a loose fit in the hole and expanding it by an explosive charge placed in a small hole in the axis of the bolt.

Liquid Air Tests on Cylindrical Specimens

Theory: The boiling temperature of liquid air is about —190 deg. C. (—310 deg. F.) and room temperature is about 20 deg. C. (68 deg. F.). It seems that a temperature range in the bolt of about 200 deg. C. can be obtained. The co-efficient of linear expansion for steel is at least 0.000010 in. per deg. C., at normal temperature, although this value may not be correct at very low temperature. For the temperature range available, the change in dimensions will be about 0.0020 in. per inch. It seems, therefore, that a bolt or pin 1 in. in diameter would become 0.002 in. smaller (0.998 in. in diameter) if immersed in liquid air until it had reached the boiling temperature of the air and would return to its former diameter upon reaching room temperature.

Specimens: In order to demonstrate the practicability of this method of body-binding bolts the following tests were made. Six blocks of mild steel were prepared, each 1½ x 3 x 6 in. A hole was bored through each piece in the center of the largest face. The holes were carefully hand reamed with an expansion reamer and had a diameter of 1.0056 in.

Three machine steel pins, 3 in. long were made for the holes. The diameters were 1.0066 in., (mark 0.001), 1.0071 in., (mark 0.0015), and 1.0076 in., (mark 0.002), the "mark" is the amount that the pin diameter exceeded the diameter of the holes.

Assembling of Specimens: The pins were held by blacksmiths' tongs and dipped vertically into liquid air. When ebullition ceased, indicating that they had reached the temperature of the air, one pin was withdrawn and placed in the hole in one of the blocks; the second block was placed over the pin. If the blocks failed to meet on the pin the upper block was driven with a hand sledge.

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The pin, marked 0.001, entered the holes readily and the specimen was assembled without driving. The pin, marked 0.0015, stuck and although driven quickly only projected about 1/16 in. through the top block and lacked about ¼ in. of passing through the lower block. After entering the holes the pin was immovable in about one half minute.

TABLE I. PULL REQUIRED TO SEPARATE THE BLOCKS. (STRAIGHT PINS)

Spec. Mark	First Block To Slip	Starting Load Lb.	Slipping Load Lb.	Second Block To Slip	Starting Load Lb.	Slipping Load Lb.
0.001	bottom	6,420	5,300 to 4,000	top	9,470	6,310
0.0015	bottom	7,060	....	top	8,080	6,700 0.12 in.-6,230 0.25 in.-6,000 0.50 in.-3,000
0.002 (0.0014)	top	8,800	6,200* 5,900* 0.02 in.-5,820 0.106 in.-5,800 0.200 in.-5,800	bottom	10,990	6,000

* After slipping started the testing machine was stopped. Slipping continued at lower loads.

As it was obviously impossible to assemble the third specimen, pin marked 0.002, it was filed down in a lathe to a diameter of 1.007 or 0.0014 in. larger than the hole.

TABLE II. UNIT FRICTIONAL RESISTANCE

Specimen Mark	Top Block Lb. per Sq.In.	Bottom Block Lb. per Sq.In.
0.001	2,410	1,635
0.0015	2,060	1,800**
0.0014	2,240	2,800

** The pin did not extend through the hole.

This pin required some driving to bring the blocks together but no difficulties were encountered.

Testing: After reaching normal temperature the specimens were loaded in a Riehle testing machine, having a capacity of 100,000 lb., so that the blocks were forced apart. The load was applied parallel to the axis of the pin. The results are given in Table I.

The area of the cylindrical surface of the hole is about 3.93 sq.in. The unit frictional resistance shown in Table II, may be found by dividing the slipping load by this area.

Examination of the pins and holes after their separation showed that the surfaces were perfectly smooth where they had been in contact. All of the holes showed some depressions below the reamed surface where the metal had been torn previous to the hand reaming operation. In general these areas did not exceed perhaps 5 per cent of the total surface.

Conclusions: These results show practically no difference in the friction between the pin 0.001 and the pin 0.0015 in. larger than the hole. The average for both of these was 1,9978 lb. or practically 2,000 lb. per square inch.

The average for pin marked 0.002 was 2,520 lb. per square inch. This may have been due the fact that the holes in these blocks apeared to have less torn surface than the others so that a larger surface was in contact with the pin.

If the pin 0.001 in. larger than the hole caused a comprehensive stress in either the pin or the block equal to the yield point of the material, as appears probable from computation, then the pin 0.0015 in. larger would not cause an appreciably higher stress. It would merely cause permanent deformation of the material in the pin or block, possibly both. The fact that the starting loads appear to be about the same for all the specimens, within the limits of the experimental errors involved, tends to show that the highest loads for these materials were reached.

Apparently by the use of liquid air, pins or bolts can readily be assembled if their diameter is larger than that of the hole by 0.001 in. for every inch of pin diameter.

Liquid Air Experiments on Taper Pins

Since in the use of liquid air on cylindrical pins difficulty was found in inserting the pins in holes after cooling, it was suggested that experiments with taper pins be made. The experiments described here were made on taper pins.

Specimens: Six pieces of mild steel 1¼ x 3 x 6 in., the same as used in the previous tests, were used for the plates in these tests. The blocks were secured in pairs and a taper hole bored through them in an engine lathe. A steel pin about 4½ in. long was turned to fit each of the three pairs of blocks.

The diameter of each pin was measured at each one-half inch along its length, and the measurements plotted to an enlarged scale. The taper was somewhat irregular but an average value was obtained from a line drawn through the points. The average values are given in Table III.

Assembling: The blocks were placed so that the holes were in line and the pins which had been cooled in liquid air were inserted in the holes and seated by a few light blows followed by one comparatively heavy blow from a hand sledge. The pins and blocks were easily and quickly assembled due to the taper of the holes.

Testing: After attaining room temperature the blocks were separated in a Riehle testing machine

TABLE III. AVERAGE TAPERS AND DIAMETERS OF PINS.

Pin No.	Taper In. per Ft.	Approximate Value	Block	Mean Diameter of Hole, In.
1	0.0535	1/16	upper	1.1593
			lower	1.1547
2	0.024	1/32	upper	1.0802
			lower	1.0776
3	0.0456	3/64	upper	1.0954
			lower	1.0903

having a capacity of 50,000 lb. The load was so applied as to cause slipping of the pin in one block at a time, except for No. 3. This was loaded so as to force the pin out of both blocks at the same time, slipping occurring in each simultaneously.

TABLE IV. PULL REQUIRED TO SEPARATE THE BLOCKS (TAPER PINS)

Block No.	Area of Contact Sq.In.	Amount of Shrinkage In Diam. In.	Starting Load Lb.	Unit Frictional Resistance Lb. Sq.In.
1 upper	4.55	0.0024	14,300	3,140
1 lower	4.53	0.0022	12,400	2,740
Average	4.54	0.0023		2,940
2 upper	4.24	0.0022	13,100	3,090
2 lower	4.23	0.0016	10,800	2,550
Average	4.23	0.0019		2,820
3 {upper, lower}	8.53	0.0024	27,000	3,240

Results: The results of the test are given in Table IV. The values reported for the unit frictional resistance are obtained by dividing the starting load by the area of contact between the block and pin. The starting load was the maximum load, the slipping load being considerably lower and rapidly falling to zero. The amount of shrinkage in diameter of the pins included in the table, was determined from the change of the position of the plates on the pins, after the pins had been contracted by liquid air. The values are based on the assumption that all the deformation took place in the pin.

A comparison of the results obtained with cylindrical and taper pins shows that the average unit frictional resistance is about 40 per cent higher for the taper pins than for the cylindrical ones. The table shows that the value of the unit frictional resistance is dependent upon the relative shrinkage of the pin to the plate and is approximately proportional to the amount of shrinkage. The load necessary to force pin No. 3 out of the two blocks is approximately twice the load necessary to force the other pins out of each block, since the area of contact is about double. The results are in close agreement with the experimental data upon the slipping loads for shrink and force fits, published in the AMERICAN MACHINIST, Feb. 16, 1899, by John H. Wilmore.

TABLE V. SIZES OF BOLTS AND CHARGES OF EXPLOSIVE

Bolt	Diam. Bolt Hole In.	Outside Diam. In.	Plate Hole Dia. In.	Detonator	Charge	Computed Pressure Lb. per Sq. In.
2	0.502	1.250	1.264	15 grains	10 grams	125,000
3	0.502	1.250	1.264	15 grains	8.5 grams	107,000
5	0.381	1.248	1.264	15 grains	5 grams	125,000
6	0.384	1.250	1.264	35 grains	none	25,000
4	0.632	1.250	1.252			
			−1.309	15 grains	5 grams	37,500
1	0.637	1.250	1.277			
			−1.310	15 grains	7 grams	51,000

Test of Body-Bound Bolts Expanded by Explosive Charge

In order to determine the effect of expanding the bolts by means of high explosives, two sets of plates with six 1¼-in. bolts were submitted for test and examination. The thickness of the plates submitted was $1\frac{5}{16}$ in. One set of plates contained bolts Nos. 2, 3, 4, 5 and 6, and the other set contained bolt No. 1. Bolts Nos. 2 and 3 were driven about $\frac{1}{16}$ in. out of the plates, and the threaded portion carried away due to the method of firing as described in the report of the Naval Proving Grounds. The size of the bolts, and the charges used are given in Table V.

TABLE VI. SLIPPING LOADS

Bolt No.	Load in Pounds for Different Amounts of Slips: 0.05 Inch	¼ Inch	½ Inch	¾ Inch	1 Inch	1½ Inch	3 Inch	Through Top Plate	Maximum Load Lb.
1	22,000	27,500	26,700	25,000	24,000	......	......	7,000	27,500
3	29,600	28,000	29,600	29,200	27,200	24,000	19,300	23,000	29,600
5	23,000	20,000	21,700	21,000	18,000	10,000	7,000	600	23,000
6	4,250	1,700	1,000	......	......	......	......	......	4,250

Bolt No. 6 fired with detonator alone was the only one that could be moved after testing as none of the others could be turned with a 24-in. wrench.

Testing: Bolts Nos. 1, 3, 5 and 6 were tested in a 50,000-lb. Riehle testing machine. The amount of slip was measured and the corresponding load necessary to force the bolt out of plates was observed.

Results: The slipping loads for different amounts of slip are given in Table VI.

It will be seen that the starting load was not necessarily the maximum load. In fact, for some of the bolts, the maximum load was not reached until the bolt had slipped from ¼ to ½ in. For all the bolts tested except No. 6, which was not expanded sufficiently, a load near the maximum was necessary to produce a slipping of 1 in. or more.

In Table VII the charge and pressure used in expanding the bolt, the maximum slipping load and unit frictional resistance are given. The percentage of metal of the bolt remaining after drilling the hole for the charge is also given.

After the bolts had been forced out of the plates, the surfaces of both the bolts and holes were examined to determine if the bolts had been in contact with the holes.

TABLE VII. CHARGES AND PRESSURES IN EXPANDING, SLIPPING LOADS AND UNIT FRICTIONAL RESISTANCE

Bolt No.	Diameter of Hole in Bolt	Detonator Charge	Charge	Pressure	Maximum Slipping Load	Unit Frictional Resistance	Amount of Metal of Bolt Remaining After Drilling Hole
	Inch	Grains	Grams	Lb. Sq.In.	Lb.	Lb. Sq.In.	Per Cent
1	0.637	15	7	51,000	27,500	2,240	75.0
3	0.502	15	8.5	107,000	29,600	2,410	84.0
5	0.381	15	5	125,000	23,000	1,880	91.0
6	0.384	35	none	25,000	4,250	350	91.0

For bolts Nos. 3 and 5, surfaces appeared to have been in good contact while bolt No. 1 showed only about four-fifths of the surface in contact. Bolt No. 5 showed only about one-twentieth of the surface in contact near the head end.

Conclusions: The results of the test show that with the use of liquid air, a tighter fit can be obtained with a tapered bolt than with a cylindrical one. The average unit frictional resistance of the test on cylindrical pins is 2,150 lb. per square inch while the average value for the tapered pin is 3,000 lb. per square inch.

Moreover, less difficulty was encountered in assembling the blocks with a taper pin than with a straight one.

The test of the bolts expanded by explosive charges shows that satisfactory results can be obtained by this method. The average unit frictional resistance of bolts Nos. 1, 3 and 5 was 2,120 lb. per square inch, which is the same as that developed in the experiments of shrinking cylindrical oversize pins by liquid air.

It appears from these tests that the size of the hole drilled in the bolt has a greater effect in producing a tight fit, than the pressure due to the explosive charges. A 1¼-in. bolt containing a hole larger than about ½ in. in diameter would be materially weakened, because of the reduction in cross-sectional area. It appears however, that a correct combination of the size of the hole and pressure of explosive charge, could be used to produce a very satisfactory fit without weakening the bolt more than 10 per cent.

What Is the Most Economical Belt?

By W. F. Schaphorst

A belt user recently wrote to a dealer in belts and asked: "What kind of belt is the most economical in the long run?"

The dealer replied: "The belt that will transmit the most power per square foot of its area during its natural length of service is the most economical."

This answer may be correct. In fact, it is correct. But, now that the belt user has the answer what is he going to do with it? The answer is certainly a very vague one. Very likely the user knew that much about it before he asked the question. What the user wants to know is I believe: What kind of belt is the most economical in the long run—leather, cotton, rubber, camel's hair, balata, etc.?

In spite of all of the substitutes that have been manufactured, leather belting still predominates. It is the superior belting for general machine shop work. Where belts must be shifted from pulley to pulley there is nothing better. In fact where finger shifters are employed nothing but leather belts should ever be permitted. Leather belts are also superior for use on quarter turn drives, reversing drives, or wherever there is constant side pull, slipping and jerking.

The cotton belt has largely replaced the leather belt in outdoor power transmission as in connection with threshing machines. It has also largely replaced the leather belt in industries where much dirt and grit is encountered, as in cement mills, brick plants, flour mills, crushing plants, etc. It is an excellent belt for use in hot and dry places. It is very strong and durable, but must never be used in connection with finger shifters because such shifters wear the edges rapidly causing them to fray and unravel and fail prematurely.

There are a number of rubber composition belts on the market, and it is claimed by many users that these belts are superior to the leather belts, which may be true for their own conditions. It is the writer's belief that the rubber belt is superior to the leather belt for use in wet or damp places, as in paper mills, dye houses, laundries, etc. In fact, it has practically replaced the leather belt in all of these industries. Like the cotton belt, however, it must never be used in connection with finger shifters because of the fact that it has a fabric core which gives it its strength and which will cause premature failure when the edges are once worn or frayed.

The life of a belt depends largely upon the good start that it gets, in the same way that the success or failure of a man depends largely upon the care given him during his childhood. Therefore, when putting a new belt on the pulley too much care cannot be given to it to see that it is put on right. The ends should be cut square. If the joint is glued there should be no "kinkiness" in the belt.

Shafts and pulleys should be aligned as perfectly as possible so that there will be no side slipping, no forcing, no everlasting running off and no sidepull.

Occasionally there is something inherently wrong in the belt itself so that after a few days of operation it will run crooked in spite of the care first given it. This may be due to the fact that one side of the belt was stronger than the other, consequently the weaker side stretched most and as a result the belt began operating imperfectly. When this happens the belt should be taken off and the imperfection carefully removed. Unless this is done it is obvious that there will always be some side slip or side pull and the life of the belt will be materially reduced. It pays to watch new belts carefully and see that they get a proper start in life. By so doing much money will be saved.

It is impossible of course, to answer the above question completely and with absolute accuracy, but the writer feels that his reply is at least more definite and more satisfactory than the reply given by the dealer.

Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Milling a Scroll

By J. A. Camm

An unusual example of milling with the machine set-up for the operation is shown in the accompanying illustrations.

The work, Fig. 1, consists of a cast-iron disk, 17 in. in diameter and 2 in. thick, and is used for a mold for spiral packing. The groove is 1 in. wide and 1 in. deep with a ½-in. wall making the pitch of the scroll 1½ in.

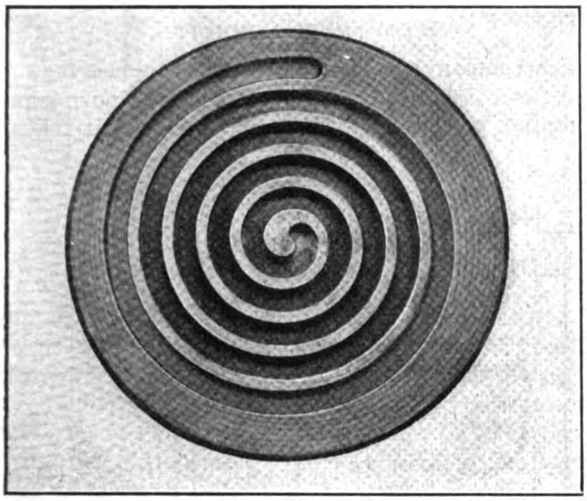


FIG. 1. THE FINISHED SCROLL

In order to secure the circular pitch of 1½ in. it was necessary to revolve the 4-pitch screw in the table of the milling machine six times to one revolution of the rotary table holding the work. This was accomplished by rigging up a standard dividing head, as shown in Fig. 2, by attaching the universal joint to the worm shaft and driving through the wormwheel to the screw by means of change gears.

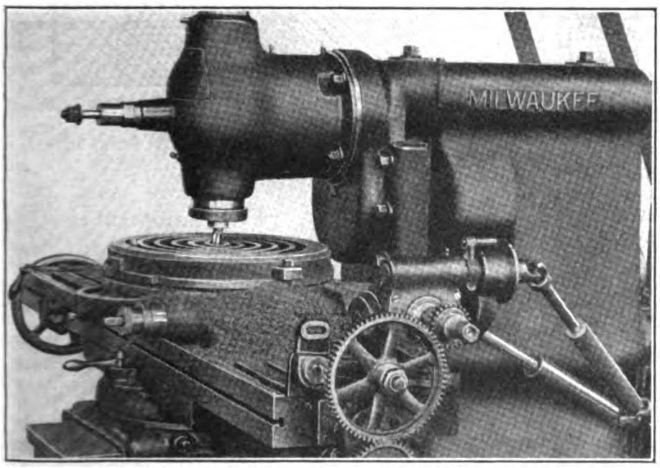


FIG. 2. MACHINE SET-UP FOR MILLING THE SCROLL

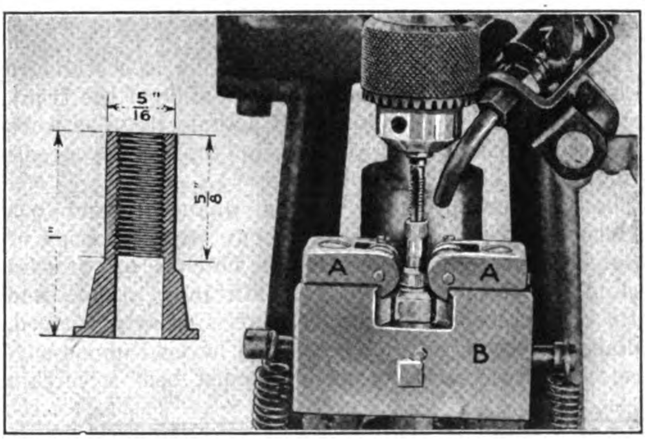
A Difficult Piece to Hold for Tapping

By Amos Ferber

Because of its thin walls and small diameter in proportion to the size of the tap, the piece shown in the illustration gave all sorts of trouble in holding it for the tapping operation. After many experiments, the device here described was made, enabling the operator to reach a production of 680 pieces an hour.

The jaws *A* are fastened to the top of the block *B* and have no movement except for purposes of adjustment. In the end of each jaw is a hardened steel roll, grooved to fit the contour of the work and serrated circumferentially with a number of sharp V-grooves like a thread without lead. Through the center of the block passes a hollow spring-operated plunger which presses the work upward, where its tapered portion enters between the rolls, the serrations of which match the corrugations of the work.

This results in an extremely strong grip on the work, without tendency to crush it, and has the further advantage of releasing quickly and cleanly. The operator has but a single lever to move and the operation of tapping is correspondingly rapid. Slippage rarely occurs.



TAPPING FIXTURE FOR THIN WALLED WORK

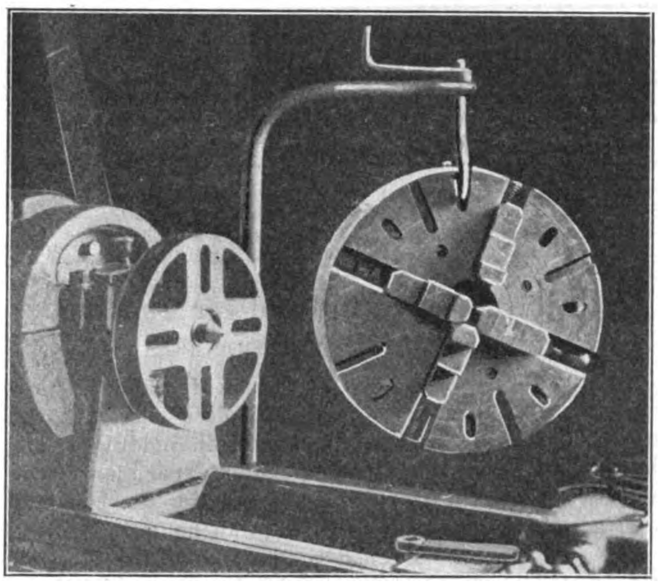
The device was designed and made by the Anderson Die Machine Co., and is used on an Anderson reversing spindle tapping machine.

Crane for Handling Lathe Chucks

By L. H. Gibbs

I am enclosing a photograph showing a very convenient time- and labor-saving lathe-chuck crane which we made and applied to our 18- and 20-in. lathes. The device is so simple that I don't think it is necessary to go into details. It can be made in any shop that has a blacksmith's forge.

The crane revolves in a bracket bolted to the bed of



THE CRANE ATTACHED TO LATHE

the lathe, and by adjusting the lever-nut which screws on the hook, the chuck can be raised sufficiently to clear the shears, and lowered so that the threads on the lathe spindle will engage properly with those in the chuck.

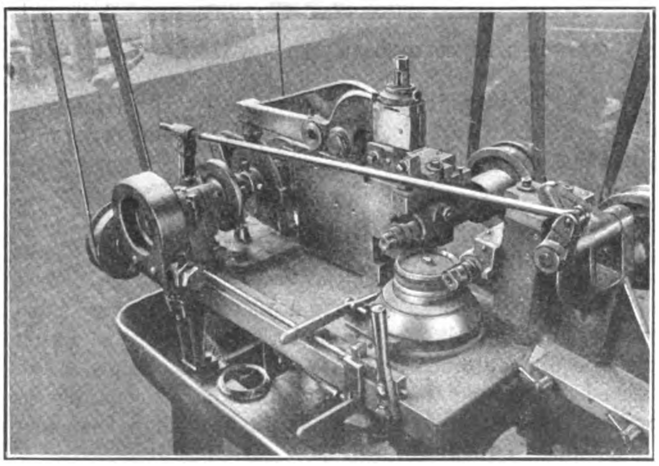
I hope that this device will prove as useful to some of your subscribers as some of those published in your magazine have been to me, even though I have been a subscriber a very short time.

Making a Standard Pinion Cutter Do Double Duty

By Milton Wright

The machine shown in the illustration is a standard pinion cutter except for the additional slide at the front, and the cam and connections that actuate it. The work is a bronze ring which forms the top of the needle cylinder of a knitting machine.

The rings are produced in large quantities and in a variety of sizes. Each ring is cut with a series of closely-spaced, rectangular-shaped notches or grooves around its circumference like teeth in a pinion, and with a corresponding number of similarly shaped, radially disposed, notches across its beveled upper surface. The two series of grooves must bear a certain definite relation to each other with respect to position, and within very close limits, but they do not coincide.



STANDARD PINION CUTTER WITH EXTRA HEAD

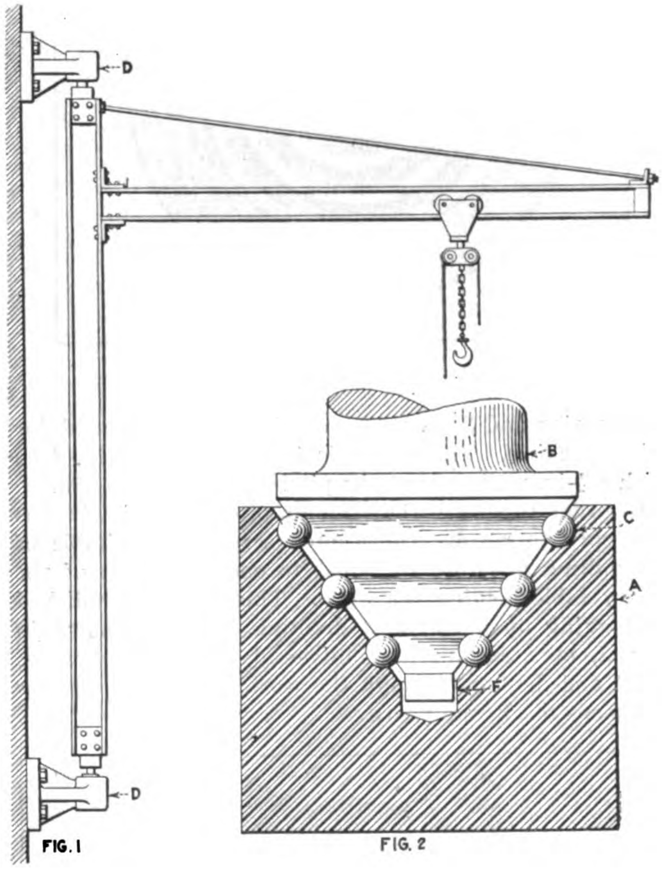
The pinion cutter as originally built would cut either series of grooves separately, or would cut them both at one setting in two revolutions of the indexing mechanism, provided the machine was reset between each turn. But this would require more time than the cutting, so the attachment was devised that enables the machine to complete both operations simultaneously, making a finished ring at each revolution.

The construction of the device is amply evident from the picture and needs no description. The production ranges from eleven to fourteen completed rings per hour, according to diameter. One operator handles six machines.

Step Bearings for a Light Jib Crane

By W. Burr Bennett

The accompanying sketches show the bearings designed for a light jib crane to serve lathes, boring mills and similar machines. The thrust and radial features have worked out satisfactorily. Fig. 1 indicates the position of the bearings at the top and bottom of the crane, while Fig. 2 gives a sectional view of the bearing construction. The outer race A, detailed in Fig. 2, is supported in the bracket D, shown in Fig. 1. Part A is made of oil quenching, non-warping tool steel, while the races are polished out after hardening and are not ground. The inner race B is of the same material as part A and is finished in the same manner. The balls C are hardened and ground steel. Pilot F is used merely as an aid in assembling.



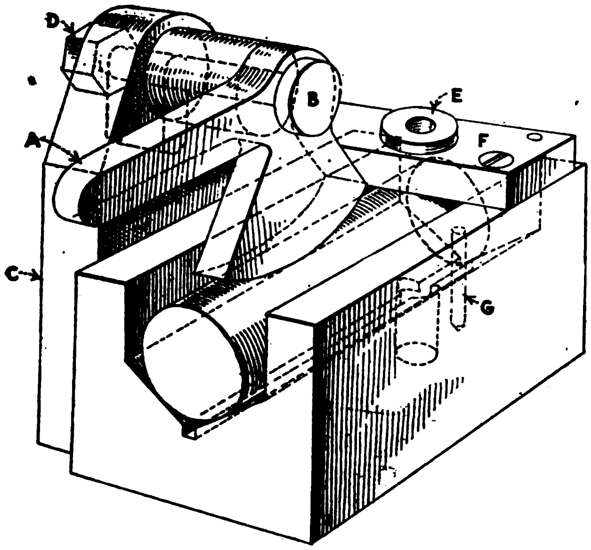
FIGS. 1 AND 2. CRANE WITH BEARINGS IN POSITION, AND BEARING DETAILS

Jig for Drilling Pin Holes in Round Work

By Francis Paquin

Herewith is a sketch of a jig for drilling holes in pins from $\frac{3}{8}$ to 1 in. diameter.

The jig body consists of a hardened V-block. The clamp *A* is a slow rise cam pivoted on stud *B* and may be adjusted to take different diameters of work by means of a slot in side piece *C*. After adjusting, nut *D* is tightened. Bushing *E* is held in crosspiece *F*. The work is located horizontally by pin *G*. The form of the cam should be such that on clamping, the work is forced towards the pin.



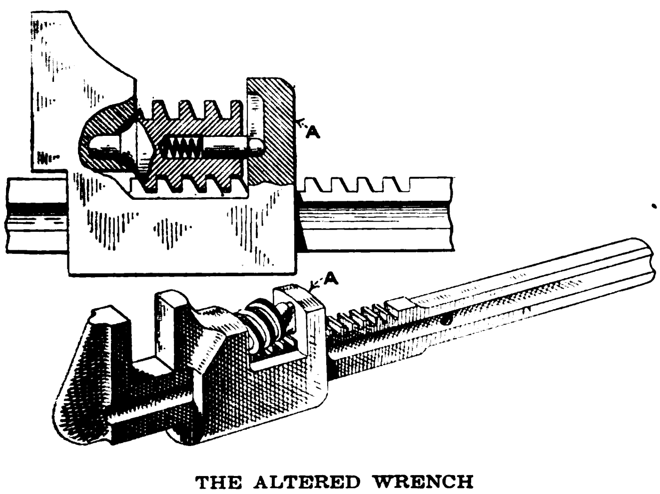
JIG FOR DRILLING PIN HOLES IN ROUND WORK

Quick-Acting Wrench

By Chas. H. Willey

One of the boys in the shop had an old automobile wrench, and having an inventive mind and some spare time he converted it into a quick-acting wrench as shown in the accompanying sketch.

A hole was drilled in the worm and a pin with a spring was inserted as indicated. The lower lip *A* of the wrench jaw was machined to allow the worm to slide out of engagement with the rack teeth when upward pressure was applied. The sketch tells the story and the inventor passes the idea along to those who may care to use it.



THE ALTERED WRENCH

Attaching a Wire Rope to a Socket —Discussion

We are in receipt of a letter from the National Bureau of Casualty and Surety Underwriters that refers to the article on the subject of attaching a wire rope to a socket, a brief account of which appeared on page 809 in our issue of February twenty-third.

The Bureau states that while it understands that this method of attachment is advocated also by others, it seems that we should point out certain limitations to proper execution that are likely to exist. The limitations are indicated by the following quotations from the letter:

"While this method of attachment when properly done gives good results, so much depends on having the job done under perfect conditions that it should not be attempted by anyone unless he is certain that the materials he uses and the conditions under which he works are perfect.

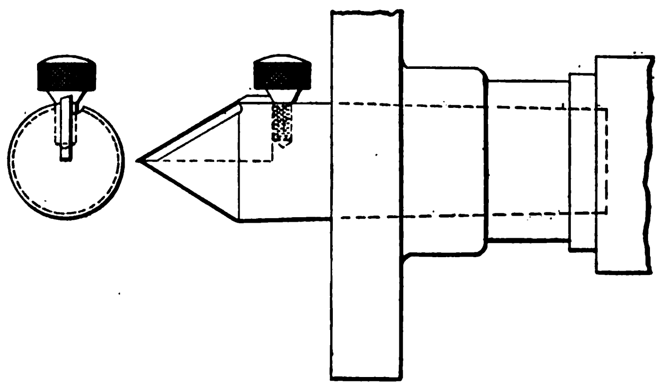
"Frequently an elevator cable will have to be hitched to a socket in a limited period of time. At times the work may be done in some place where the repairman can not have the proper equipment with which to work. As a result and regardless of his skill, the job may be imperfect.

"If you will refer to the 'Safety Code for Elevators,' published by the American Society of Mechanical Engineers, you will find that they advocate the turned-in method of attachment, which position, I believe, was taken largely because of their realization that with that method there is a greater chance of success in a greater number of cases than would be the case if the plan suggested by your writer were followed."

Combined Lathe Center and Center Scraper

By J. A. Raught

The illustration shows a combined lathe center and scraper for drawing over centers in work that has not been truly centered. The advantage of the contrivance is that the work does not have to be removed from the lathe centers.



SCRAPER FOR DRAWING A CENTER

In using it, place an indicator against the work, chalk the side to be scraped off and turn down the thumbscrew, to cause the cutter to press against the work. Roll the shaft part way around and back by hand, then relieve the pressure on the cutter by turning back the thumbscrew. Repeat if necessary until the center is drawn over the desired amount. The groove will take care of the chips.

EDITORIALS

An Aid to Foreign Trade

IT MAY surprise some people to learn that there is coming to be an efficient, active and much-consulted governmental aid to foreign commerce in Washington. It is the Bureau of Foreign and Domestic Commerce in the Department of Commerce, and some idea of the esteem in which it is now held may be gained from the fact that it received a larger appropriation from Congress this year than last, a really remarkable tribute in a time of retrenchment like the present.

The director of the bureau, Dr. Julius Klein, whose interesting job it is to make Secretary Hoover's dream of a government department to which business men can look with confidence for aid, come true, attributes the granting of the increased appropriation to the voice of American business which made itself audible to the representatives in Washington at the crucial moment. That American manufacturers and merchants are awakening to the usefulness of this bureau is indicated by the increase in the number of daily inquiries from 750 to over 2,000. The inquiries now coming in are not general ones, but very specific requests for tariff rates, market conditions, shipping instruction, etc.

A significant fact is the way in which several recent foreign loans have been handled. The banks which have been approached for loans have applied to the State Department for advice as to the advisability of granting them. The State Department has given its opinion from the political point of view, but has asked the Department of Commerce for its judgment on the economic side.

In several cases the Department of Commerce has been able to render valuable service by pointing out that no possible return could be expected by American merchants either because the money wanted was to be used for bolstering weak budgets, or because it was to be spent in the purchase of materials under specifications so written as to bar Americans from bidding. If all foreign loans followed this procedure we should be in a fair way toward having a real foreign trade policy.

Machinery concerns that are not making use of the services of the Bureau of Foreign and Domestic Commerce are missing an opportunity. The more inquiries it receives and answers, the more service it can render and the more support it can expect from Congress.

It's the Kind of Overhead That Counts

THERE is much loose talk of "overhead" and perhaps more men deceive themselves regarding it, than about any other item of business. Roughly speaking, the overhead charges of many businesses seem to average about 150 per cent of direct labor. This means very little unless we know all the circumstances. It isn't the percentage of overhead but the *kind* of overhead that really counts.

If the work is such that no machine equipment is required, the overhead should be low for a high overhead would mean too much rent or too high a cost of inspection and supervision, or both.

On the other hand a high overhead may be a sign of good management for it is the total cost of the product which counts, and not any single item which enters into that cost. If the increased percentage of overhead is due to a decreased labor cost, owing to the introduction of improved machinery, it may easily mean a real economy.

Be sure that no item in the overhead is unnecessary. Be sure that each one helps to make the product better or cheaper. But remember it's the *kind* of overhead that counts; not the overhead itself.

Machine Tool Users Really Buy Production

FEW buyers of machine tools realize the instability of the market or how limited is the demand. Even fewer buyers appreciate how much they depend upon machine tools for carrying on their work, or how helpless they would be without them.

Without machine tools there would be no manufacturing—our industrial development would cease. An unhealthy condition among builders of machine tools affects all other industry.

Owing to the high production secured from machine tools and their long life, the demand can be supplied by comparatively few machines. This means that the cost of development of special tools and fixtures must be charged to a small number of machines and shows why machine tools cannot and should not be sold at a price per pound which compares with that asked for other machinery.

As a matter of fact, the purchaser of machine tools really buys productive capacity, rather than so many pounds of iron and steel. He buys the ability to produce machinery of various kinds in tremendous quantities and at a relatively insignificant cost. Whether the machine tool be large or small, light or heavy, is of little importance if the production is satisfactory. The cost can be spread over so many thousands of pieces manufactured as to be almost negligible.

This is one of the things which it is difficult for the manufacturer who uses machine tools to understand. Thanks to efficient machine tools his own product is low in price, and he fails to realize that because of this very efficiency the market for the machine tool is limited.

Take the case of a special machine for a certain motor part. It is a very ingenious machine and does its work rapidly and well. It cost something over a hundred thousand dollars to develop the first one and there probably is not a market for over one hundred such machines in this country. This means that each machine must carry a development burden of a thousand dollars added to the cost of building and selling, plus a fair profit. And yet some buyers attempt to value such machines on a pound basis as though they were just so much pig iron or coal.

They must remember that they are not buying merely machine tools, but productive capacity—and they must be willing to pay accordingly.

Shop Equipment News

Clark Gasoline Elevating Platform Truck

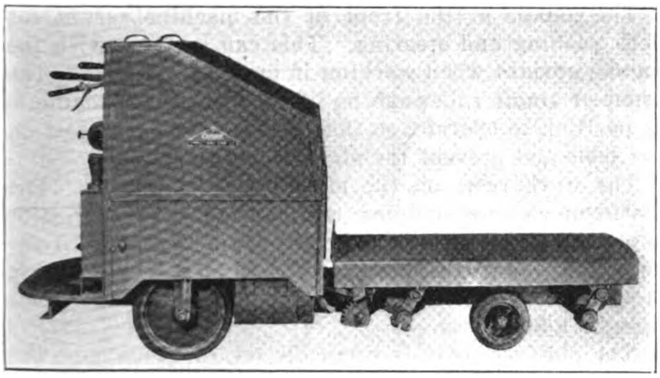
The accompanying illustration shows a gasoline-driven, elevating, platform truck that has recently been placed on the market by the Clark Tructractor Co., Buchanan, Mich. The truck conforms in appearance and uses to the electric lift truck. It is stated to have ease of maintenance and flexibility, and to be capable of continuous 24-hour service if necessary.

The loading platform is 26 in. wide and 54 in. long. It will elevate a load of 4,000 lb. from a minimum height of 11 in. to a maximum height of 16 in. in 8 sec. Automatic stops are provided to control both the upper and lower limits of travel. The elevation can be stopped at any point by means of a control lever. The lifting mechanism is operated by hydraulic pressure.

The power for both the locomotion of the truck and the elevation of the load is derived from a 15-hp., 4-cylinder tractor engine, having 3⅛-in. bore and 4½-in. stroke. The motor is mounted in the closed compartment at the rear, in which are placed also such parts as the transmission, governor, vacuum tank and radiator.

In order to provide three-point suspension for the entire tractor, the forks carrying the steering wheels are supported on a steel casting pivoted at the center of the frame. The two steering wheels are of cast steel, and have 16 x 3½-in. tires. The two rear wheels under the loading platform serve for driving, and are equipped with 10½ x 5-in. rubber tires.

The drive from the motor is through a bevel geared axle equipped with ball and roller bearings. Two speeds are provided in each direction. The construction resembles very much the standard automotive type, so that the truck can be cared for by an automobile or truck mechanic.

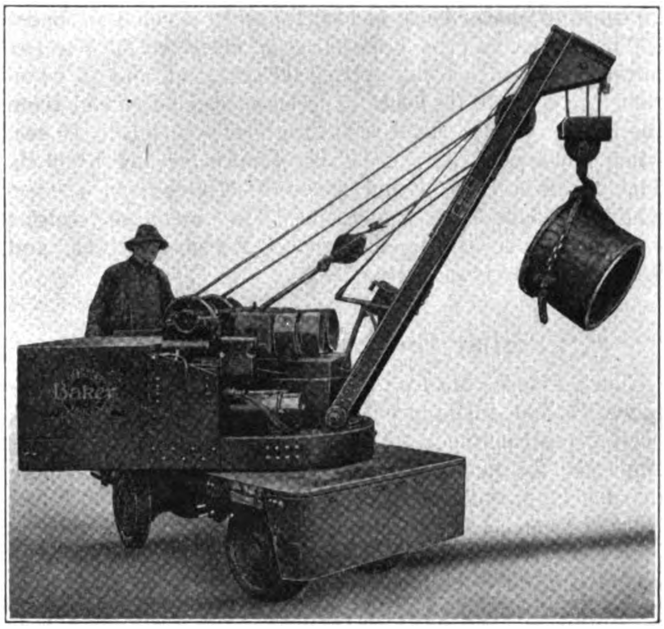


CLARK GASOLINE ELEVATING PLATFORM TRUCK

The driving and elevating controls are mounted on the rear of the engine compartment, where the driver rides in a standing position. The brake lever pedal is under the driver's foot, so that the tractor stops automatically if the operator steps off the machine while it is running. The machine is especially useful for departmental and inter-plant haulage. It will climb a grade of 10 per cent with a 4,000-lb. load. The overall length is 107 in., width 35½ in. and height 51 inches.

Baker Locomotive-Type Industrial Crane

The photograph shows in operation a three-movement, locomotive-type industrial crane recently placed on the market by the Baker R. & L. Co., 2180 West 25th St., Cleveland, Ohio. The crane is intended for lifting and carrying work of all sorts about shops and yards. It has a capacity for lifting 2,000 lb. at a radius of 4 ft. from the pivot of the crane, and 1,600 lb. at a radius of 8 ft. With these loads held on the hook, the cargo can be transported from one place to another. It is easily possible to raise and lower the boom, which is 96 in. long, in order to vary the radius at which the lifting is done. When it is not necessary to transport a load, but merely to lift it, out-riggers can be employed.



BAKER LOCOMOTIVE-TYPE INDUSTRIAL CRANE

The operator stands on a platform at the rear, and has all of the controls on the dash in front of him. The machine is driven by a series-wound, totally inclosed motor running at 1,150 r.p.m. It is capable of a speed of 6 miles per hour in either direction. It drives on all four wheels, and steering is also done on all four wheels. The operator steers the truck by means of the horizontal tiller handle.

The controller is of the drum type and provides three speeds in each direction. A quick make-and-break switch interlocks with the controller, and is operated by the brake pedal, so as to break the circuit when it is desired to stop. Four pairs of helical springs serve to cushion shocks from the road bed. The tires are solid rubber, 20 in. in diameter, and 3½ in. in width in the front and 5 in. in width under the crane end. Worm-type axles having radial and thrust ball-bearings are provided. The wheels are of steel.

A 21-plate Ironclad battery or an Edison battery may be used. The battery is inclosed in a steel compartment, the sides and top of which are removable. The battery

and the crane-operating mechanism are mounted on a base that swings with the load to counterbalance it.

The lifting mechanism is controlled by a push-button located on the dash of the truck. It consists of a Sprague electric 1-ton hoist, having spur and worm gear reduction, and driven by a totally inclosed motor. An electric brake is provided on it. The boom may be hoisted by means of a similar 1-ton hoist operated by a totally inclosed motor, and provided with a brake.

In order to swing the crane, another inclosed motor with an electric brake is provided. The battery and crane swing about a large center stud on a bearing 28 in. in diameter equipped with eighty-seven 1-in. balls.

The hooks can be hoisted at a speed of 45 ft. per minute without load, 20 with 1,000 lb. load, and 15 when carrying a 2,000-lb. load. The boom can be raised from the bottom of its travel to its highest position in 10 sec. when not loaded, and in 15 sec. when carrying 1,000 lb. The crane can be swung through 270 deg. in 12 sec. whether loaded or unloaded. The machine weighs 6,600 lb. when equipped with an Edison battery, and 6,730 with an Ironclad battery.

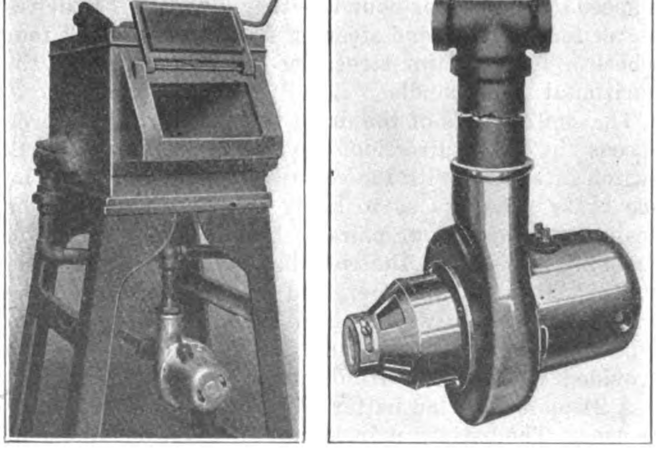
Cadillac Electric Furnace Blast

The Clements Manufacturing Co., 601 Fulton St., Chicago, Ill., has just placed on the market a motor-driven blast for attachment to small gas furnaces such as are employed for heat-treating. The blast consists primarily of a $\frac{1}{8}$-hp. universal motor operating on any specified voltage from 32 to 250, and propelling a small blower.

A view of the blast is shown on the right of the accompanying illustration, and the manner of attaching it to the furnace is shown at the left. The blower is connected to the gas pipe, draws in air from the room, and delivers the mixture directly to the furnace. A damper is provided for regulating the mixture.

The motor can be driven from the lighting circuit merely by attaching a plug to a convenient socket. It can thus be operated without the necessity of having the line shaft turning, as is often necessary with the ordinary style of blower equipment. Due to the speed of the motor, the furnace can be brought to the working temperature very quickly.

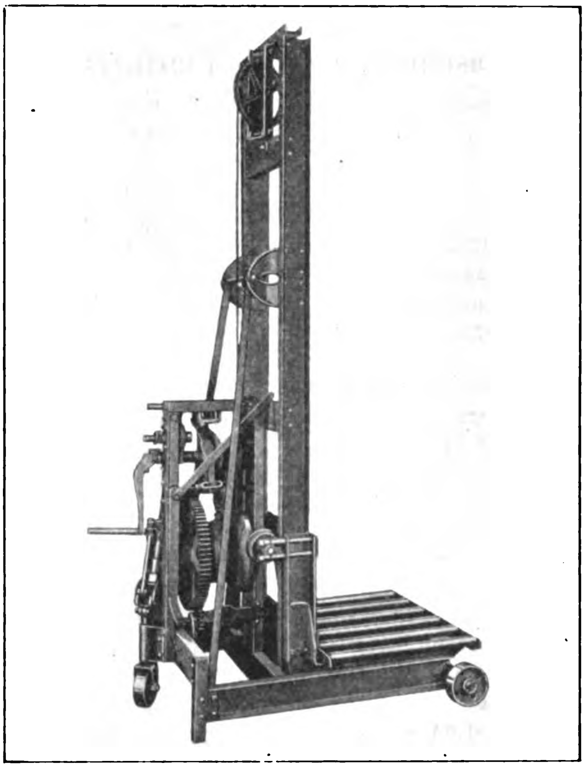
Fluctuations in the gas pressure do not affect the operation of the blower or of the furnace, so that constant conditions can be maintained in the furnace. The blast delivers 210 cu.ft. of air per minute when running at 10,000 r.p.m. It weighs 9 lb., and 13 lb. when packed.



CADILLAC ELECTRIC FURNACE BLAST

Lewis-Shepard Stacker

The accompanying illustration shows a machine intended for lifting, transporting and tiering materials in a shop or warehouse. The device, designated as a



LEWIS-SHEPARD STACKER

stacker, has recently been placed on the market by the Lewis-Shepard Co., 560 East First St., Boston, Mass. It is made of structural steel and is mounted on three roller-bearing wheels 7 in. in diameter, so that it can be conveyed about the shop either loaded or unloaded.

The handle at the front of the machine serves for both pushing and steering. This can be done with the handle upright when working in cramped quarters. The front or single roller can be lifted when the machine is in position to operate, so that the two steel legs rest on the floor and prevent the stacker from moving.

The work rests on the platform at the right. The platform can be supplied with either a roller top or a plain top, its minimum height from the floor in the two cases being 10 and 8 in. respectively. The platform is 36 in. wide and 24 in. long, and the size of the whole base 39 x 50 inches.

The platform travels vertically on 5-in. channels, one at each side. Easy movement is given by the rollers running on the edges of the channels. It should be noted that these vertical channels are hinged, so that the top portions may be lowered. It is thus possible to move the stacker through doorways. The height at which this hinge is placed, as well as the length of the channels, can be furnished to suit the work at hand. The standard machines are supplied in heights up to 14 ft. The joint can be locked when the stacker is in use.

The machine may be operated either by hand or by electric power. As shown, the hand crank is connected through gearing to the drum on which the cable connected to the table is wound. The 500-lb. capacity stacker has a lifting speed of 13 ft. per minute when the crank is turned at 60 turns per minute. With the

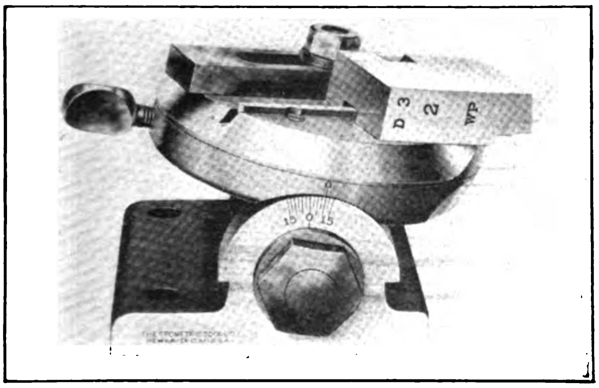
same speed of the crank, the lifts are 11, 8, 5 and 4 ft per minute, respectively, for the machines of 750, 1,000, 1,500 and 2,000 lb. capacity. On all except the smallest size, an additional speed is provided that doubles the speeds just mentioned. In this way the platform may be lifted rapidly when lightly loaded.

When lowering the platform it is not necessary to turn the crank. By pulling on the lever above the gearing, the brake is released, so that the weight of the load causes the platform to descend. As soon as the operator ceases to pull on the lever, it returns to its original position and the clutch engages, so that the platform is held stationary. The speed of lowering depends upon the force with which the lever is pulled. The combined clutch and brake is of the automobile type, and has a single dry plate. It is completely enclosed and is self-adjusting.

Geometric Chamfer Grinding Fixture

The illustration shows a grinding fixture recently placed on the market by the Geometric Tool Co., New Haven, Conn., for grinding chamfers on the milled chasers made by the concern. The fixture may also be used for grinding tapped chasers, although in the latter case the grinding is straight and does not conform exactly to the contour of the threads. The use of the fixture permits of grinding equally all chasers of a set. When the chamfers are ground unevenly most of the cutting is done by one or two chasers, which is apt to result in threads having incorrect lead or taper.

Either left-hand or right-hand chasers may be ground on the fixture. The table of the fixture is graduated and can be set for grinding either long or short chamfers. The narrow key on the top engages the keyway in the chaser and acts as a guide while grinding. An adjustable stop governs the position of the chaser with respect to the grinding wheel. The side of the fixture is graduated to permit of tilting the table to the desired angle of chamfer clearance. One grinding fixture accommodates all sizes of chasers. When used for $\frac{5}{16}$-in.



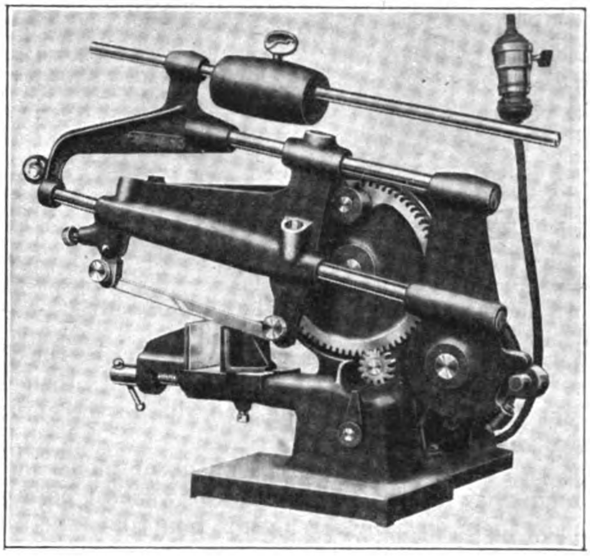
GEOMETRIC CHAMFER GRINDING FIXTURE

chasers, it is necessary to remove the key at the top of the table and guide the chaser in the keyway.

The fixture may be bolted to the table of the grinding machine, and the chaser slid forward by hand to the wheel and against the stop provided. It may be set forward by means of the machine handwheel or lever. The fixture can also be mounted on the machine slide, and the chasers ground by passing them across the edge of the grinding wheel. For this purpose, a wheel of sufficient size must be available.

Edlund Bench Hack Sawing Machine

The machine shown in the accompanying illustration is a power-driven portable hack sawing machine for mounting on a bench. It has recently been placed on the market by the Edlund Machinery Co., Inc., Cortland, N. Y. It is intended for fast cutting on small jobs ordinarily performed by hand, or on work regularly



EDLUND BENCH HACK SAWING MACHINE

performed by larger machines. It can be used on tool steel as well as softer metals.

The power is supplied by a small electric motor, connected to the machine through gearing. Current for the motor can be taken from any convenient lighting socket. The saw arm has two rods on which the saw frame slides. The arm stays in position when raised by the operator for placing work in the machine. Cutting is performed on the backward stroke, and the arm raises on the forward stroke, so that the saw blade is relieved from the work.

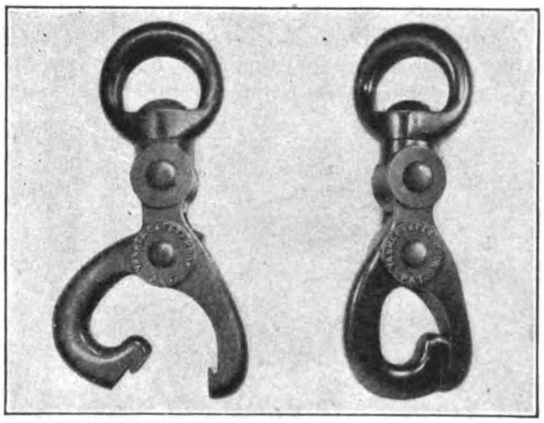
The position of the weight on the top of the arm is adjustable, so that the pressure of the feed can be varied to suit the type of work being cut. An 8-in. blade is used, and it may be changed without the use of any tool. The machine stops automatically when the cut is finished, although it can also be stopped and started at any time during a cut. A screw-operated vise is provided for holding the work. The wearing parts can be easily replaced when they have become worn.

Yankee Safety Hook

Frank W. Trabold, 30 Church St., New York, N. Y., has recently placed on the market the "Yankee" safety hook for use on hoists and cranes when lifting loads. The accompanying illustration shows the hook in both the open and closed positions. It will be noted that the load hangs directly on a curved member pivoted on the other longer member shown at the left side.

It will be noted that in the closed position, the hook engages with a dovetail on the straight member. Engagement is made possible by an elongated hole in the top of the hook, so that it can be raised slightly. At the top of the longer straight member is pivoted a member to which is ordinarily attached a swiveling ring. The lower portion of the top member rests against the top

of the hook, so that the hook cannot be swung out of position unless the top member is also swung to the side. Thus all load must be off the hook in order to



TRABOLD "YANKEE" SAFETY HOOK

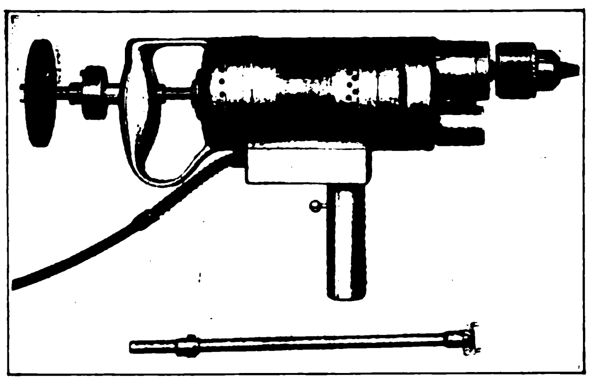
open it. The hook member ordinarily carries the load alone. When the load becomes excessive, then the straight member shares in the load, due to the engagement of the dovetail.

The two pins in the hook are made of monel metal. Although they are intended to be the weakest points of the hook, their shearing strength is four times the rated load. Due to the fact that the outer end of the hook is supported, the hook does not straighten out when the load exceeds the elastic limit of the metal in it. Thus, failure of the hook can occur only when the load exceeds the ultimate strength, and not when it exceeds the elastic limit. Due to the fact that the point of the hook is covered, it cannot catch on parts which it strikes while the load is being lifted.

For attachment directly to a cable, the third or swiveling member may be omitted. When the hook is attached to a block for either a pulley or a chain, the top member ordinarily swivels directly in the lower part of the block. The hoist is ordinarily made in sizes having capacities of 1, 3, 5, 15 and 25 tons.

Louisville Electric Drill Grinding Attachment

The accompanying illustration shows a grinding attachment in place on a ⅜-in. portable electric drill, so as to adapt the tool to such work as sharpening toolbits



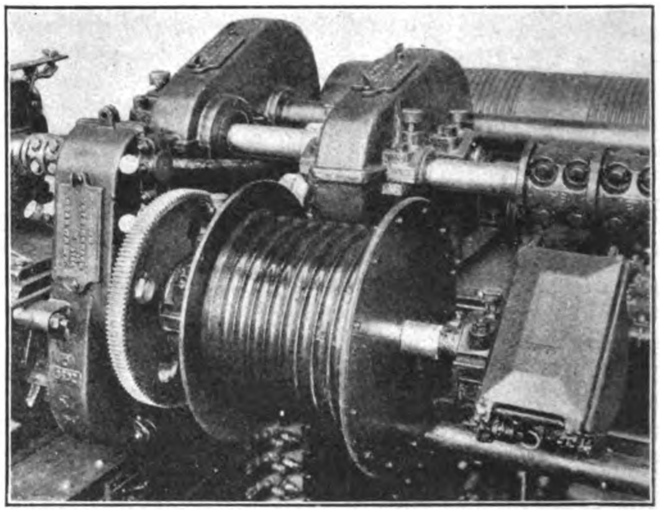
GRINDING ATTACHMENT ON LOUISVILLE DRILL

This attachment has recently been applied by the Louisville Electric Manufacturing Co., Thirty-first and Magazine Sts., Louisville, Ky., to its Pioneer "garage special" drill. The drill has the usual drilling spindle as well as a device for oscillating the valve grinding tool. The tool for driving the valve while grinding is shown below the drill in the accompanying illustration.

The grinding attachment fits in the rear of the armature shaft and passes through the handle. It may be put in place and removed quickly. The bearing that fits in the handle is equipped with ball bearings for the spindle, the speed of which is normally 9,000 r.p.m. The tool can be furnished to operate on either alternating or direct current of either 110 or 220 volts. The abrasive wheel usually carried is 2 or 3 in. in diameter.

Pawling & Harnischfeger Feeder-Cable Retriever

The Pawling & Harnischfeger Co., Milwaukee, Wis., has recently placed on the market a winding device or retriever for the cable supplying current to a lifting magnet carried by a crane. The accompanying illustration shows the device applied to the carriage of a



PAWLING & HARNISCHFEGER CABLE RETRIEVER

5-ton crane having a 70-ft. span. The large, flanged drum is driven by the motor that hoists the magnet.

The retriever keeps the cable taut at all times, so that no slack is allowed. The cable thus winds evenly on the drum, and cannot work over the flange. The drum is driven only while the magnet is being hoisted. Although the drive is through gears, the final drive is through friction members. The gearing is so proportioned that it tends to drive the drum at a peripheral speed 20 to 50 per cent in excess of the speed at which the magnet is being hoisted. If there should be any slack in the feeder cable when the hoisting starts, it is immediately taken out. After that, the friction members slip and keep a constant tension in the cable of about 40 lb. This tension is adjustable.

When the magnet is being lowered, the cable drum is not driven. A pawl engages in a ratchet wheel to prevent revolution. The pull of the magnet thus unwinds the cable from the drum against the retarding force of the friction mechanism, so that a uniform tension is always maintained.

All the bearings are bronze bushed. The current is brought to the drum through collector rings and carbon brushes that operate in the same manner as the

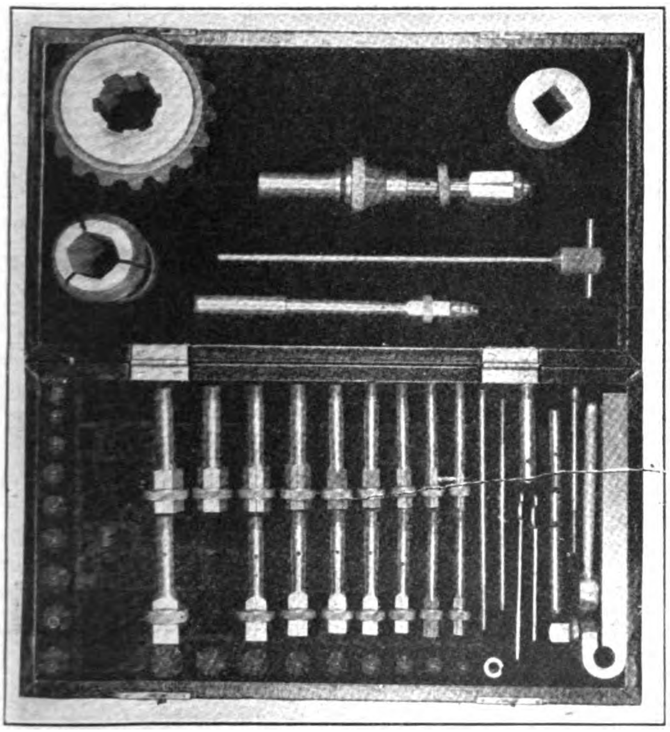
slip rings of alternating-current motors. The collector is mounted at the end of the shaft and inclosed in a metal housing, so as to be completely protected, although available for inspection. The cable is attached to the collector rings, passes through a hole in the center of the shaft, then along the drum arm, and through a hole in the rim. It is then wound on the drum itself. There are no exposed electrical contacts.

Hollander Adjustable Broaches

The Edward Hollander Tool Co., 142 Miller St., Newark, N. J., has recently placed on the market a line of adjustable broaches, a set of which is shown in the accompanying illustration. The tool is intended for use primarily in a shaper, although it can be used in a drilling machine, lathe or screw machine. Its chief application is in shops where a broaching machine is not available. Although adapted chiefly to tool room use, it is applicable to regular production.

With the tool it is possible to broach holes that do not go entirely through a part, so as to enable an ordinary broach to be employed. It is necessary, however, that there be some recess at the bottom of the hole. An example of this sort of work is the broaching of a hole through one side of a hollow cylinder. A number of strokes are necessary in order to bring the hole up to size. The tool is started at its smallest size in a drilled hole, and its size increased with each stroke. It is stated that it leaves a very fine finish on the work and that it is very accurate. Samples of work are shown on the cover of the box. Splines can be cut in holes, as well as the squares and hexagons for which this set is intended.

The tool is made in two styles. The simplest form, type B, is shown lying on the cover of the box near the hinges. It consists of a shank, on one end of which are the cutting edges. This end is slit in the center of each flat face, so that it can be expanded when a conical member is screwed into it. The screw is on the front end of the tool, and is turned by means of the slender rod shown that can be passed entirely through the hole while the shaper is running.



HOLLANDER ADJUSTABLE BROACHES

The type A broach is shown lying on the center of the cover. It consists of a holder that can be held in any suitable shank, and that has a mechanism for expanding the cutter. By means of graduations on the collar, the expansion of the tool can be read directly in thousandths of an inch. Any size of cutter can be secured to the front end of the holder. In the set shown cutters for holes from $\frac{1}{4}$ to $\frac{3}{4}$ in. across the flats are furnished in $\frac{1}{16}$-in. steps. The smaller sizes are held by means of a reducing coupling. It will be noted that cutters for both square and hexagon holes are furnished.

The small parts shown along the edges of the box are the conical expanding members. These members serve as guides for the cutters and bear against the sides of the cylindrical hole. The tools ordinarily cut to a depth of $2\frac{1}{2}$ in., although an extension attachment is provided that enables cutting to 5-in. depth. Cutters either smaller or larger than those in the set can be furnished for use with the same holder.

The rings shown around the cutters in the box hold the cutting edges together, so that they do not spread outward on the first cut. The cutting edges are spread for each succeeding stroke, as shown by the tool lying on the cover of the box. The micrometer adjustment on the type A holder enables bringing the holes to exact size. The expanding mechanism enables the putting of relief on holes that are broached through die plates.

Sharpening of the cutters is done by merely grinding the front face. It is stated that fifty holes can usually be cut without grinding. The cutters can be furnished either individually or in sets to suit any requirements. At the right side of the box can be seen a shank for holding the broaches, and wrenches for use in changing the cutters in the holder.

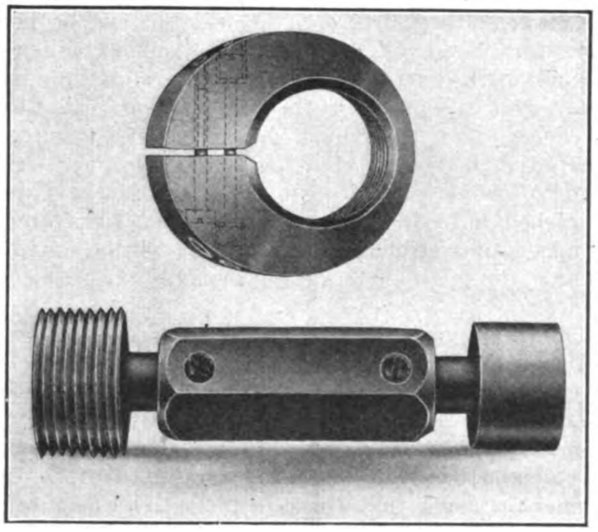
"Superior" Thread Gages

The Superior Thread Gauge Manufacturing Co., 1985 Troy Ave., Brooklyn, N. Y., has recently placed on the market the ring thread gage shown at the top of the accompanying illustration. The principal feature of the gage is that the hole is eccentric to the outside diameter. In this way, sufficient spring is obtained at the small section of the gage to enable adjustment of size.

It is not necessary to put one or more saw cuts partially through the ring, as is ordinarily done when the hole is concentric with the outside of the gage. Thus the continuity of the thread is not broken, except at the one cut which is necessary to provide adjustment of size. The threads are more apt to retain their correct form during the hardening process than if they are cut into several sections. By placing the hole eccentrically, a smaller outside diameter is possible than with the concentric style.

The size is adjusted by means of the screws that are shown dotted on the top of the gage. A hole near the threads contains a small rod, against which at each end a setscrew bears. By tightening the screws, the gage is expanded. The other screw is used for drawing the ring together, so that the gage may be held rigidly at any size in its range. The gage is intended especially for work on production where an adjustment of size is necessary.

At the bottom of the illustration is shown a plug gage, the ends of which are removable. At one end, a plug thread gage of the size desired is fitted, while

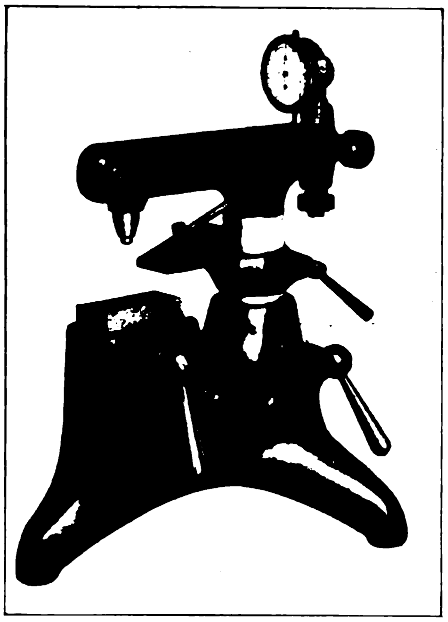


"SUPERIOR" THREAD GAGES

a plain cylindrical plug equal to the root diameter of thread is held at the other. Setscrews bearing on milled recesses in the shanks of the ends hold the gages securely in the handle. Both the ring and the plug gages are made in sizes for U. S. S. and S. A. E. threads from ¼ to 2 in. in size. They can be furnished larger to suit special work.

American Amplifying Gage

In the accompanying illustration is shown an amplifying gage that has recently been placed on the market by the American Gauge Co., Dayton, Ohio. The tool is similar to the larger gage made by the concern, although it is more limited in its range and does not have all of the attachments that are furnished on the large gage. The gage is intended for use in grinding and inspection departments, but it is particularly well adapted to grinding departments, where a number of gages are required and the flexibility of the equipment is not so important.



AMERICAN AMPLIFYING GAGE

The tool can be furnished in two sizes, one for measuring round work from ¼ to 2 in. in diameter and the other for work from 2 to 4 in. in diameter. The adjustments and the movements provided can be seen in the illustration. The anvil block can be removed and its position adjusted, as can also the stop for the work. The height and position of the measuring point are controlled by moving the entire arm of the machine. Clamping levers serve to lock the adjustments in place.

The gage stands on a bench, and can be easily moved to the place required.

Fundamentals of Budget Control

In an address before the Taylor Society in Philadelphia, on March 7, George E. Frazer of Chicago outlined the fundamentals of budget control as follows:

I. Elements in Control.
- (1) A responsible organization.
- (2) Accounts that lead to accountability.
- (3) The business budget, i.e., estimates of future accounts as basis for future accountability of responsible organization.

II. Responsible Organization.
- (1) Separation of policy making from executive powers.
- (2) Executive clothed with complete executive authority.
- (3) The line of authority.
- (4) Staff assistants to the president.

III. Types of Organization in Their Relation to Accountability
- (1) Functional.
- (2) Territorial.
- (3) Commodity.
- (4) Combinations of three basic types.

IV Accounts Reflecting Accountability.
- (1) Functional accounting.
- (2) Territorial accounting.
- (3) Commodity accounting.
- (4) Classification of accounts must reflect the accountability actually existing, not the theoretical accountability.

V. Business Budgets.
- (1) Estimates of future accounts in terms of future accountability.
- (2) Functional estimates.
- (3) Territorial estimates.
- (4) Commodity estimates.
- (5) Future budgets in terms of present personalities.

VI. Budget Administration.
- (1) Must be in terms of organization.
- (2) To be practicable must be reduced to ratios, i.e., standard percentages or variable percentages.
- (3) Illustrations as to sales quotas.
- (4) Illustrations as to production standards, e.g., machine rates.
- (5) Illustrations as to credit standings, e.g., the conventional ratio of quick assets to current liabilities as used by commercial bankers.

He emphasized the necessity for a separation of the policy making and the executive functions, the necessity of responsibility with control, and a classification of expense to show accountability.

German Machine Tool Exports Decrease

The following analysis by the industrial machinery division of the Department of Commerce, based on the latest figures received from Germany, indicates that there has been a considerable decrease in the volume of Germany's machine tool exports during 1921, as compared with 1920 and the pre-war year 1913:

	7 Months May-Nov. 1921 Metric Tons.	12 Months 1920 Metric Tons.
Belgium	7,547.7	7,452.7
Denmark	780.8	2,806.6
Alsace-Lorraine	468.4	1,827.0
France	5,087.9	13,668.3
Great Britain	1,057.7	1,619.7
Italy	3,466.7	7,546.3
Netherlands	4,559.3	19,054.1
Norway	360.6	1,535.1
Austria	2,823.7	4,978.7
Czecho-Slovakia	1,796.6	3,360.4
Sweden	533.3	5,433.5
Switzerland	1,738.5	11,760.7
Spain	1,238.4	3,268.9
South America	1,582.8	2,949.4
Other countries	6,003.7	7,659.8
Total	39,046.1	94,921.2

Taking the total of 39,046 metric tons for the seven months of 1921 and employing the same ratio for the missing months, 1921 would give a total of approximately 67,000 metric tons, a falling off in volume of 27,921 tons from 1920 and of 23,279 as compared with 1913.

Safety Engineers Affiliate with A. S. M. E.

The council of the American Society of Mechanical Engineers, at a meeting held March 6 in Kansas City, accepted the petition of the American Society of Safety Engineers for affiliation with the A. S. M. E. By this action 600 new affiliate members are added to the A. S. M. E. membership role, which is rapidly reaching 20,000.

The affiliation was effected under the provisions of the A. S. M. E. by-laws, according to which the privilege of affiliation with the A. S. M. E. may be obtained by any regularly organized engineering society which by constitution, by-laws and practice is in accord with the A. S. M. E., on the approval of the governing boards of each. The society so affiliated has independence, autonomy and self-control under its own constitution and by-laws, and the A. S. M. E. is not responsible for its acts.

Mexican Chamber Organized in New York

Sponsored by several prominent New York business men, the Mexican Chamber of Commerce of the United States, has been organized and has established itself in offices in the Woolworth Bldg. in that city. The chamber has been incorporated under the laws of New York.

The directorate is composed of citizens of both countries who are actively engaged in important industries. Among the directors are: Gumaro Villalobos, Elbert Gary, Carlos B. Zetina, James W. Gerard, S. L. Alatriste, Grafton Greenough, Francisco P. De Hoyos, Russell R. Whitmann, George L. Le Blanc, Carlos R. Felix, Jose Miguel Bejarano, Joseph Hodgson, G. G. Cano, Jerome S. Hess, L. J. Roel, M. L. Gallagher. Officers are: President, S. L. Alatriste; vice-presidents, James W. Gerard, Jerome S. Hess and Russell R. Whitmann; treasurer, Jose Miguel Bejarano.

Hendey Machine Co. Publishes Anniversary Book

In celebration of the completion of fifty years in the machine tool business, the Hendey Machine Co. has published a limited edition of a 112-page book dedicated "To the men who build our machines and in the building strive for perfection; to the friends who use our machines and in the using realize our aims." The book is beautifully printed on heavy paper and illustrated by photogravure portraits of the presidents of the company and by halftones of the different shops occupied and the product produced in them.

The story opens with a tribute to the founder, Henry J. Hendey, and his ideals, and tells of the early struggles of Mr. Hendey and his brother Arthur to establish a business in the years 1870-73. The foundation of the joint stock company followed in 1874. Then follow descriptions of the various buildings and the different machines built by the company.

A brief account is given of the war activities of the Hendey Machine Co. and its adherence to the high standards of its founder. Then comes a word on the work of the company since the armistice and a conclusion telling of the fulfillment of Mr. Hendey's vision of a successful combination of the ideal with the practical.

Gear Manufacturers at Buffalo This Month

Plans are rapidly being completed for the annual convention of the American Gear Manufacturers' Association, which will be held in Buffalo, N. Y., on April 20 to 22, with headquarters in the Hotel Lafayette.

The papers to be presented at the technical sessions cover a wide variety of subjects pertinent to the gear manufacturing field. Among those already scheduled are: "The Use of the Projection Comparator in Testing Gear Teeth," by Ralph E. Flanders of the Jones & Lamson Machine Co.; "Good Practice for the Cutting Faces in Clearance of Hob, Gear and Form Cutter Teeth," by H. E. Harris of the Harris Engineering Co.; "Proportions of Industrial Gears," by G. E. Katzenmeyer of the R. D. Nuttall Co.; "The Grinding of Gear Teeth and Its Future in Industry," by R. S. Drummond.

Besides the committee reports and the various entertainment features, there will be presented an explanation of the Gleason Works system of bevel gears by F. E. McMullen of that company.

The secretary of the association is F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Government Bureaus to Study Drill Steels

A mining engineer and a metallurgist are to be selected by the Bureau of Mines and by the Bureau of Standards in the near future to make an intensive study as to present practice in the heat-treatment of drill steels and the extent to which breakage occurs. These engineers are to make a much more exhaustive survey than ever has been attempted before. They will submit a report to the advisory board which is co-operating with the bureaus in the study of rock drill steels and other steels which must withstand impact stresses. The advisory committee is composed of B. F. Tillson, T. R. Lawson, George T. Cousins, H. S. Brainard, J. A. Mathews, George H. Clark, H. M. Boylston, Van H. Manning, F. W. Deonton, Walcott Remington and Bradley Soughton.

The survey about to be undertaken is under the immediate supervision of D. A. Lyon, chief metallurgist of the Bureau of Mines, and G. K. Burgess, of the Bureau of Standards.

The Trend of Business Improvement—Plants Resuming

The Bridgeport Casting Co., Bridgeport, Conn., has increased operations at its plant from a four-day week to a full six-day week basis.

C. H. Wills & Co., Marysville, Mich., manufacturers of the Wills-Sainte Claire automobile, have advanced production from 15 to 20 cars a day, giving employment to about 600 operatives at the plant.

The Ames Shovel and Tool Works, Elwood, Ind., have resumed operations on a full time, full week basis.

The Harrisburg Pipe and Pipe Bending Works, Harrisburg, Pa., have adopted a double-shift operating schedule in a number of departments at the plant, including steel works, coupling shop and coil shop.

The Cyclone Motors Co., Benton Harbor, Mich., will commence operations at its new local plant this month, with a production schedule of 50 motorcycles per day.

The Osgood Bradley Car Co., Worcester, Mass., has received a contract from the Connecticut Co., for twenty-five one-man cars for its traction lines, totaling $150,000. The company has orders on hand to insure full operations for some time to come.

The Autocar Co., Ardmore, Pa., manufacturer of motor trucks, has increased the working schedule three hours a week at its plant. Orders received for the first quarter of the year are 25 per cent in excess of those for the corresponding period in 1921. The plant is giving employment to about 2,000 men.

The Singer Manufacturing Co., Bridgeport, Conn., manufacturer of sewing machines and parts, has advanced operations from 3 to 5 days a week at the local plant.

The Haynes Automobile Co., Kokomo, Ind., is doubling its output, as compared with the basis of production for a number of months past.

The Stover Manufacturing and Engine Co., Freeport, Ill., is increasing production at its plant and is now operating at close to normal.

The Burden Iron Co., South Troy, N. Y., manufacturer of horse shoes, bar iron, etc., has resumed production at its plant after a shut down of about a month. About 1,000 men will be employed.

The Reo Motor Co., Lansing, Mich., is giving employment to a full working force, with entire plant operating on close to full time. The working hours in a number of departments will be increased at an early date.

The Frick Co., Waynesboro, Pa., manufacturer of agricultural implements, is increasing operations at its plant, with incoming orders about 50 per cent in excess of those received at this time a year ago. A complete new foundry will be erected, with daily capacity of about 60 tons of iron castings, designed to give employment to over 500 molders. The present foundry will be demolished upon the completion of the new structure, and the site used for the construction of additions to the machine shops.

The Moon Motor Car Co., St. Louis, Mo., has adopted a 25 per cent increase in production schedule for April and May, as compared with the same months of last year. The company has sufficient orders on hand to insure capacity operations until well into July.

The Remington Arms Co., Bridgeport, Conn., has advanced production to a 48-hour week basis at its local firearms plant, replacing a three-day week schedule, operative for some time past. The works will give employment to 3,000 persons. The cutlery division is employing approximately 800 workers under an increased production basis.

The Motor Axle Co., Flint, Mich., has adopted a full time operating schedule in all important departments at its plant, replacing a short-time working basis, prevailing for a number of months past.

The Peerless Motor Car Co., Cleveland, Ohio, is operating on the highest production schedule that has been attained since May, 1920. Record shipments of complete cars are being made.

The Mullins Body Corporation, Salem, Ohio, manufacturer of automobile bodies, has increased its working force by about 500 men.

The John A. Roebling's Sons Co., Trenton, N. J., manufacturer of wire, wire rope, etc., is operating on a 60 per cent capacity, as compared with a 35 and 40 per cent basis a few months ago.

The General Motors Corporation, Detroit, Mich., is operating its different plants on a production basis of 60,000 passenger cars, motor trucks and tractors during the current quarter of the year, as compared with an output of 24,600 cars of all kinds in the corresponding period of a year ago. The Buick division is leading all others in output. The total production in February was 21,000 cars as against a total manufacture of 8,900 cars in the same month of 1921.

The Foote-Burt Co., St. Clair Ave., Cleveland, Ohio, manufacturer of machine tools, etc., is increasing production to handle incoming orders.

The Chicago, Milwaukee & St. Paul Railroad Co., Chicago, Ill., has arranged an appropriation of $10,000,000 for new equipment, to include cars and other rolling stock, rails, repair shop equipment, etc. An order has been given to the Pullman Co., Chicago, for 1,000 box cars, and to the Western Steel Car and Foundry Co., Chicago, Bettendorf Axle Co., Bettendorf, Ia., and the General American Tank Car Co., New York, for similar cars, totaling 1,000, 1,500 and 500 cars, in the order noted.

The Ruggles Motor Truck Co., Saginaw, Mich., is increasing operations at its plant, with the adoption of a production schedule calling for 2,000 motor trucks during the present year. A branch plant has been established at London, Ont., and is now in operation to handle Canadian business.

The Pressed Steel Car Co., Pittsburgh, Pa., has secured an order for 2,000 seventy-ton coal cars from the Norfolk & Western Railway Co.

The Hendee Manufacturing Co., Springfield, Mass., manufacturer of motorcycles, has arranged a production schedule of 1,400 complete machines for April and the suceeding months of the year. Up to the present time the monthly output has been on a basis of 600 motorcycles.

Foreign Markets for American Farm Machinery

An opportunity for American manufacturers of potato machinery to extend their markets is presented in the increased development of that industry in Ireland. A list of dealers in agricultural implements and machinery in Ireland can be secured from the Bureau of Foreign and Domestic Commerce.

Horse-drawn wheel plows, duck-foot chain harrows, cultivators, and seed-drills are in demand in Sardinia, the Department of Commerce is informed. This market is attracting the attention of British exporters and should also prove to be well worth the attention of American manufacturers of such implements.

Tooth harrows are used more than any other in South Africa, but there is a constantly increasing demand for the disk type. In the Northern Transvaal there is considerable increased farming activity, and the demand for implements and machinery in this section merits consideration.

In East Africa, agricultural development is making rapid progress and the demand for machinery and implements is now greater than it has ever been in this region. The tractor market in South Africa is largely in the hands of American exporters, and according to our British competitors, this is largely due to American enterprise and superior selling methods.

Windmills and well-drilling machinery offer a good market in South Africa. Both the government and private firms and individuals are excellent prospects. The year 1921 showed an increase in buying of these articles as compared with 1920 and the demand for them continues unabated with excellent prospects for a further increase in 1922. The trade in windmills is largely in the hands of American manufacturers and, although British manufacturers are showing an increased interest in this market, there is no reason why the American product can not hold its leading position.

Census Shows Distribution of Machinists in 1920

Additional figures from the Bureau of Census show the re-distribution of machinists and toolmakers during the ten years between 1910 and 1920. A few comparisons are given herewith:

St. Paul, Minn., had 2,251 machinists and toolmakers when the 1920 census was taken. There were 1,760 in 1910.

Camden, N. J., had 2,042 machinists and toolmakers when the 1920 census was taken. This compares with 1,391 in 1910.

Vermont had 3,135 machinists and toolmakers when the 1920 census was taken. This compares with 2,321 in 1910. New Mexico had 1,137 machinists and toolmakers in 1920 and 518 when the 1910 census was taken.

Reading, Pa., had 1,980 machinists and toolmakers in 1920. This compares with 1,534 in 1910. Salt Lake City, Utah, had 838 machinists and toolmakers in 1920, and 516 when the 1910 census was taken.

Nashville, Tenn., had 988 machinists and toolmakers when the 1920 census was taken. This compares with 711 machinist and toolmakers in 1910.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE

Editor, *Commerce and Finance*, New York

At a private dinner given in New York last week sixteen important and well informed men of large affairs were present. They were all bitterly opposed to the passage of the bonus bill but they were nevertheless unanimous in saying that they believed that the Senate would attach to it a rider providing for the necessary revenue by a sales tax, and that in this shape the bill would be returned to the House of Representatives and passed by a large majority. They all agreed that if this happened a period of wild inflation and speculation was likely to follow because the money distributed would be rapidly spent and because a sales tax would provide a comparatively painless method of raising a revenue so large that it would incite further extravagance on the part of Congress.

While I am not entirely in sympathy with this view and still hope that the Senate will have the good sense to quietly inter the bonus bill, I feel that it is my duty to present both sides of the picture, and if the bonus bill is passed and the sales tax produces the revenue that many people expect it will yield, I must admit that the result will be an era of political extravagance during which prices will at first advance sensationally and afterward decline disastrously, because the purchasing power of the nation will be dissipated by the drafts made upon it to support a program of unbridled extravagance. We now face an estimated Treasury deficit of about $300,000,000 for the next fiscal year, and the prospect of increased taxes to meet this deficit and to pay the interest on the sums which states and municipalities are borrowing with apparently so little thought of the day of reckoning is not alluring, although the prosperity resulting from the expenditure of these sums, by inducing what I once termed the "anasthesia of inflation," may render us temporarily insensible to its possible after effects.

Markets Still Strong

The resumption of the upward movement in the speculative markets last week, after a reaction to allow trade and industrial improvement to catch up, is due, I think, to a renewed appreciation of these conditions. The forces which have been making for recovery, particularly of the easing money markets, are as strong as ever. There is no decrease in the avidity of the demand for good investment securities. Last week Liberty third 4¼s, which sold at 83 in 1919, crossed par for the first time since their issue, and the continued strength of the market would seem to foreshadow further cuts in rediscount rates in addition to the reductions announced by the Atlanta and Chicago Federal Reserve Banks last week.

Stocks are strong. They have recovered most of their recent decline and in some instances have advanced to new high levels for the year, a gain which clearly could not have been supported had not a sufficient number of people believed that industrial recovery is destined to go further or that we are on the eve of an orgy of expenditure. What they call it depends entirely on how far ahead they are looking and is immaterial as long as their belief in higher prices and better business in the near future is strong enough to lead them to buy stocks.

With the sole exception of sugar the same renewal of strength is evident in all the commodity markets. Cotton, which has been rather droopy as a result of the extension of the New England textile strike, is higher as this is written and, though trade may remain apathetic until the trouble is settled, the statistical position is too strong to allow much of a decline. Secretary of Labor Davis seems to think that the prospects of a settlement are much brighter, though he does not indicate what direction it may take. The coal strike has been utterly without effect on any market and the apathy with which the public regards it is the surest sign that it is beaten before it starts. Even though all union miners answer the strike call disintegration of their forces is likely to set in before a fortnight has passed. Old cotton merchants and stock traders are disposed to buy on strike news.

Industrial Improvement Continues

The advance in coffee bears out frequent predictions made in these letters and strengthens our confidence that sugar will go higher despite the reaction of the past week, which is simply one of the temporary recessions by which all upward movements are punctuated. The rapidity with which the surplus supply of sugar is being distributed is one of the most impressive examples the markets have ever shown of the effect of low prices in increased demand. Grains also are higher, though they have a long way to climb to regain the peak of a month ago.

While these markets are recovering from their hesitation, industrial improvement is unabated. Freight car loadings continue substantially above the levels of a few weeks ago and railway earnings so far announced for February indicate a net return for the Class I roads of close to $55,000,000, or less than $2,000,000 short of 6 per cent return contemplated in the Transportation Act. These figures reflect business which was initiated all the way from two to four months ago, when sentiment was less optimistic than it has been lately, and there are no indications of any decrease in buying since.

If figures on unemployment are any indication, other industries are going ahead in much the same way. In New York last week there was a demonstration of the extent of idleness which was intended to be impressive but turned out to be amusing. The Council of the Unemployed arranged a parade to call attention to the numbers who have no means of supporting themselves and more than a hundred policemen were detailed to care for the traffic arrangements. As a result there were about four policemen to each parader, for the crowd which finally turned up at the City Hall numbered twenty-eight men, not enough to carry the banners which had been prepared.

Both by sections of the country and by industries, reports show improving business and better prospects. Eugene Meyer, Jr., managing director of the War Finance Corporation, who is touring the West, is convinced that even the sheep and cattle growers are now in a position to operate profitably. Refreshing optimism comes from the agricultural implement trade and business improvement is reported from such divergent sources as Pacific Coast distributors, Southern grocers and the Kansas City Reserve Bank, which tells of increased buying power throughout the rich area which it serves and describes the outlook as the most encouraging in any time during the past two years.

There are many other specific items which are significant of the trend. Steel companies are obtaining higher prices without difficulty and the *Iron Age* states that March orders will show the largest total in nearly two years. Department store trade in volume, allowing for price declines, equals or exceeds last year's remarkable showing. The widespread building activity is a very encouraging feature of the situation. Increased orders for automobiles are reported from the West and the output has been gaining steadily since the first of the year.

The Foreign Outlook

Ratification of the treaties negotiated at Washington, the Irish peace, better prospect of a settlement in the Near East, and increasing possibility of an early recognition of Mexico, are important facets of the most favorable international outlook in months. If the Genoa conference yields anything of importance it will surprise most people in this country, but the opportunity is so great that Europe's statesmen may rise to it. The decline in marks to 0.0028¼ almost certainly heralds the quick ending of Germany's "catastrophe boom." Prices are said to have advanced 50 per cent since last fall and it is absurd to expect that the wage earners of Germany will much longer be willing to accept near-worthless paper in exchange for their labor.

Otherwise it has been difficult to find unfavorable items in the news of the week. John Moody states that "In all my experience in over 30 years in Wall Street, I never saw the stage so completely set for a constructive period such as I believe is ahead of us for the next year or two."

Business Conditions in England

BY OUR LONDON CORRESPONDENT

The lockout in the engineering trade has started. Confined at present to members of the Amalgamated Engineering Union, it cannot at the moment effect more than about 400,000 men and youths, nearly a quarter of whom would be out of work anyway. But it may perhaps affect the whole of the engineering and even the shipbuilding industries, and several of the unions have been given another fortnight in which to decide whether they will agree to the employers' terms regarding management, or join the skilled mechanics shutout. The dispute arose ostensibly on account of the working of overtime, but the employers' terms having been rejected by ballot in the course of which not one-quarter of the members voted, the leading engineering trade union was then faced with the lockout, with the certainty that the whole question of management would be raised and the almost sure prospect that wages and ordinary hours of labor would be revised. The condition of the industry as a whole is such that whether the works are shut or open will not make much material difference to the employers; they may lose less by shutting down than by keeping open. This applies mostly to the machine tool side but least to the electrical engineering section. On the other hand, the engineering trade union, like most of the other unions, has had its funds depleted as the result of a long spell of bad trade, and generally speaking is in no position to make a lengthy fight; in fact its only hope is to draw funds from other unions who may be in no better pecuniary position.

Idleness Decreasing

In the world outside engineering it really does seem that some improvement can be noted, as for the last five or six weeks the numbers of the unemployed have shown decreases, and some decline has been visible in the cost of living as officially calculated. The latest available figures show 1,837,233 persons registered as wholly unemployed, which is a decline of 97,000 in the last seven weeks; and 131,000 are on emergency work provided by the government and other authorities. Then too money has been easier and since the last letter was written the bank rate here has been reduced to 4½ per cent. With this decline the clearing banks reduced their deposit rate from 3 to 2½ per cent, this being 2 per cent below the bank rate as compared with 1 per cent below in the pre-war period.

The improved employment figures hardly apply to the engineering and metal trades, though in some districts more blast furnaces have been put into operation and the coal output has considerably improved; indeed the miners have been setting up records. But their wages have been reduced and the low rates in some districts have caused disquietude in the minds of people, both in and outside the industry, as it is recognized that even with commodities at pre-war prices the earnings could hardly provide a living of reasonable standard. As to shipbuilding, it has been estimated that work is in actual progress on only 28 per cent of the slips.

The machine tool industry certainly shows no improvement in trading conditions (one firm of machine tool merchants will shortly open a restaurant, using most of its showroom area for that purpose), and the depressing circumstances are reflected in the annual report for 1921 of the Machine Tool Trades Association. This report states that during the year twelve firms resigned, "nearly all in consequence of having ceased to be machine tool makers." The membership is put at 142, compared with the year previous which showed 162. This shows a decline, not of twelve as reported, but of twenty. Moreover, during the year previous six applications for admission were refused. The concerns who have withdrawn are not specified, but it is stated that one firm resigned after having been fined £100 for participating in an engineering exhibition organized by a Glasgow corporation. This exhibition policy has possibly led to the resignation of two or three other concerns, both makers and agents. One firm that has come out of the lists had previously been known as printers' engineers, and during the war entered the ranks of machine tool makers owing to circumstances, being then engaged in the production, by arrangement, of an American grinder and a lathe.

The report of the association gives no survey of the year but, as usual, contents itself with recording matters of domestic interest. One of the paragraphs relates to the fencing of machinery, members having been supplied with copies of a letter on the subject written by an inspector of factories in which they were "urged to make every effort to manufacture machines in such a way that they should be safe to operators." This subject naturally interests the British Industrial Safety First Association and the latest report provides an analysis of the causes of 317 deaths which occurred during a number of years as "issued by a prominent company." Apparently the accidents analyzed are not confined to a single industry. A point is that they show the deaths from mechanical causes to form 35.6 per cent, and from non-mechanical causes 64.4 per cent. Thus it is pointed out, supporting the statement made by the deputy chief inspector of factories here, that only about 30 per cent of all accidents involve machinery to any extent and that even with the fullest provision of safeguarding a decline of about 10 per cent only could be expected. At the annual meeting of the association, held in London on March 8, little of a technical character was discussed, the chief points raised relating to publicity matters. Individual members were undoubtedly cheerful, but the sombre character of the outlook was shown by the reference made by the president, Sir Alfred Herbert, to the prospects of the exhibition to be held by the association towards the end of 1924.

The small tool trade has been maintained better than the trade in machine tools, but of course not on anything like the ordinary scale. There can be little doubt that stocks to a considerable amount are still in hand, and this fact has been used in some instances as an inducement to buyers, on the ground that for the tools in hand no charges on account of safeguarding of industries duty will be made. By this duty of course measuring instruments become key industries and are subject to an import duty of one-third their value. The effect has been definite and has shown itself particularly in the case of some Swiss products where, in addition to the duty the exchange works to the disadvantage of the importer, sterling being quoted lower in Geneva than anywhere else. In certain lines, particularly micrometers, the competition offered by British manufactured goods may be regarded as negligble, and though a few firms have mentioned that they "would be shortly placing on the market, etc.," little that is tangible has resulted. Vandervell & Co., a firm of automobile fitting manufacturers is entering the small tool market and with a separate factory near Brighton, about 50 miles from the main factory, at Acton, W., produces calipers and similar implements, V-blocks and other aids to the engineering workman and to the toolmaker; but up to the present the micrometer has been left alone.

The usual order for small tools is of meagre proportion—a dozen twist drills being specified at a time by large firms —and the high-speed steel, etc., market experiences the same conditions. Stainless irons are common, but as applied to tableware—spoons, forks, etc.—seem to be too leaden in appearance. Rumors have concerned themselves with the sale here of German small tools, but the writer has had some difficulty in locating these and is disposed to think they have reference to pliers, combination tools and the like, rather than with the small tools of the machine shop.

Engineers To Co-operate

The various British technical institutions of engineers, including civil, electrical, mechanical, mining and so on, have always acted somewhat independently, the idea of each apparently being to form a self-contained unit with its own house and organization. Now as the result of a visit by engineers from America, the Institution of Civil Engineers agreed to call a conference to consider a closer connection, and the Institution of Mechanical Engineers at any rate will co-operate. The Institution of Electrical Engineers, it may be worth mentioning, has been celebrating its jubilee. For although it was founded in 1871, being then known as the Society of Telegraph Engineers, the first ordinary meeting was not held until February 28, 1872. The chief feature of the celebration was a series of discourses, chiefly by way of reminiscences of experiences in electrical engineering, one of the speakers being able to state that as a lad he attended certain of the lectures given by Faraday at the Royal Institution. Another feature of the program was a lecture by Prof. J. A. Fleming on "Michael Faraday" and the foundations of electrical engineering, demonstrated by experiments with much of the apparatus used by Faraday himself at the institution. The Institution of Electrical Engineers is the largest of the British technical societies, the membership now exceeding 10,000.

Chicago Letter

March business in the machine tool industry in the Chicago center has held its own in spite of the "see-saw" trend. Although the dealers as a whole have not yet arrived at definite figures, many of them have stated that March will prove as good if not better, than February which was a very good month. The outlook and business conditions appear to be improving throughout the entire country and trade activities in the iron and steel products market for the Chicago district are keeping pace.

Inquiries are growing in number but many are for small and miscellaneous machinery. One of the most extensive lists is that issued by the U. & J. Carburetor Co. That company was burned out by the recent disastrous fire near the machine tool district and is looking for a new factory location. The temporary location of the firm is 510 West Van Buren Street.

Railroads are still inactive with the exception of the Santa Fe which is inquiring for the following: One 500-ton double-end hydraulic wheel press; one 90-in. motor-driven, driving wheel lathe; one heavy-duty double-end car axle lathe with motor drive; one 300-lb. Beaudry hammer; one 52-in. car wheel lathe; one 4-ft. radial drill, and one 15-ton crane.

Activities in the crane market in this center are also optimistic. Among the recent orders booked by a local firm are two 40-ton cranes for the Sterns-Rogers Co., Denver, Col.; three cranes for the Coshocton Iron Co., Monongahela City, Pa., one each 10, 5 and 2-ton. This same firm is also active in the foundry machinery market and recently received an order for thirty-six tumbling barrels, and nine No. 8 cupolas from the Ford Motor Co.

A very nice word of optimism comes from the report of the seventh district of the Federal Reserve Bank, that the per cent change in the machine tool employment situation since a year ago shows a decrease of 12.5 per cent. This figure is 27 points smaller than that of last month.

It is understood that the Illinois Central R.R. purchased 15,000 tons of rails. The Chicago, Burlington & Quincy received bids recently and is expected to award the contract soon for 1,000 tons of structural material for its new Chicago freight terminal. The Chicago, Rock Island & Pacific is receiving bids for 1,600 tons of steel for bridge construction.

Plans have been drawn for a one story plant, 120 x 180 ft. to be located at 4603-19 Fullerton Ave. Henry Newgard & Co.. 947-55 West Washington St., manufacturer of electrical specialties, is the owner. The cost of plant and equipment will amount to $75,000, it is estimated.

Black & Decker Declare Dividend

The Black & Decker Manufacturing Co. has just declared a dividend for the first quarter of this year at the rate of 3 per cent on the preferred stock. The company set its sales quota for this year a half million dollars higher than the actual sales last year and for the first quarter of this year it advises that 100 per cent of this quota has been made.

Idle Freight Cars Total 216,661 on March 15

Freight cars idle because of business conditions on March 15 totaled 391,797 compared with 398,982 on March 8, a decrease of 7,185, according to reports just received from the carriers of the country by the car service division of the American Railway Association.

Of the total 216,661 were surplus freight cars (cars in good repair and immediately available for use if traffic conditions warranted) while the remaining 175,136 represented freight cars in need of repairs in excess of the number normally regarded as being unfit for service owing to their condition.

Surplus coal cars in good repair numbered 79,803, a decrease within a week of 6,661 but owing to a falling off in the loading of grain principally in the Northwest, an increase within that period of 382 cars was reported in the number of surplus box cars, the total being 89,356. Surplus coke cars amounted to 2,561, a reduction of 899 within a week while a decrease of 138 was reported for stock cars which totaled 19,739.

Engineering Advertisers Elect Officers

At the annual meeting of the Engineering Advertisers' Association held recently in Chicago, Julius Holl, advertising manager of the Link-Belt Co., was elected president. J. B. Patterson, of the P. H. & F. M. Roots Co., was chosen vice-president. The new secretary is H. N. Baum, of the Celite Products Co., and the treasurer is C. H. Connell, of the Weller Manufacturing Co.

Mr. Holl, the new president, has been with the Link-Belt Co. for ten years. During the war he was head of the publication section of the Emergency Fleet Corporation and was later assistant to the Director General of that body.

Elimination of Waste Effective in Many Countries

Millions of dollars can be saved to the nation by the elimination of waste in industry, L. W. Wallace, of Washington, executive secretary of the American Engineering Council of the Federated American Engineering Societies, declared at a joint meeting of the Chicago Chapter of the Society of Industrial Engineers and the Western Efficiency Society at the Auditorium Hotel in Chicago, recently.

Mr. Wallace, who as vice-chairman directed the nationwide assay conducted by the Hoover Committee on Elimination of Waste in Industry, said that the publication of the Committee's report was "an event that will be far-reaching in its beneficial effects on industry, not only in the United States but throughout the world." He added that engineers and industrialists were coming to agree with Secretary Hoover that the opportunity for advance in living standards in this country lies more surely in the steady wiping out of industrial wastes than in great inventions.

Mr. Wallace said that the Hoover Committee's findings had already borne fruit in Europe as well as in America. Inquiries have already been set on foot by governments and private industry in other nations and the Republic of Czecho-Slovakia has officially distributed the report as a guide for its industrialists in the upbuilding of the new nation's manufacturing enterprises.

In the United States, results of the committee's work are now evident in the building trades, printing trades, metal trades and boot and shoe, textile and ready-made clothing trades.

Edward P. Maguire Dead

Edward P. Maguire, general manager of the Lapointe Machine Tool Co., of Hudson, Mass., died on March 28. Mr. Maguire had been connected with the Lapointe interests for many years and was general manager since 1914.

Machinery Exports Fall Down in February

The increase in metal-working machinery exports was short lived. The value of February exports was $715,245, a decrease from $925,825 in January. The value of exports in February, 1921, was $2,781,781. The detailed figures, which are those of the Bureau of Foreign and Domestic Commerce, follow:

EXPORTS OF METAL-WORKING MACHINERY

	February, 1921		February, 1922	
	Number	Value	Number	Value
Lathes	..	$442,491	44	$35,521
Boring and drilling machines	..	....	127	36,212
Planers, shapers, and slotters	..	....	10	12,073
Bending and power presses	..	....	12	103,135
Gear cutters	..	....	251	3,583
Milling machines	..	....	27	23,791
Sawing machines	..	....	28	7,735
Thread-cutting and screw machines	..	....	43	8,011
Punching and shearing machines	..	....	21	38,579
Power hammers	..	....	48	8,871
Rolling machines	..	....	1	189
Wire-drawing machines	..	....	6	60
Polishing and burnishing machines	..	....	4	1,853
Sharpening and grinding machines	..	148,410	786	65,211
Chucks, centering, lathe, drill and other	..	......	1,455	13,112
Reamers, cutters, drills, and parts for machine tools	..	......	100,735	82,556
Pneumatic portable tools	..	......	278	21,242
Foundry and molding machinery	..	......	127,883	14,230
Other metal-working machinery and parts thereof	..	2,190,880	795,341	239,281
Total metal-working machinery	..	2,781,781	......	715,245

Thirty machine tools, valued at $13,763, were imported in February. In February of 1920 the number of machine tools imported numbered 271 and their value was $29,633. During the eight months ended with February, there have been 2,583 machine tools imported, valued at $115,338.

War Department Disposes of Remaining American Tools in Belgium

Only a Few Tools on Hand and Most of Them Incomplete—Deal with La Construction Metallique Reflects Credit on Our Sales Organization

By C. E. Carpenter
President, C. E. Carpenter Co., Société Anonyme, Paris

The United States War Department's stock of machine tools in Belgium has been purchased by E. R. Frederick, who for the past two and a half years, has represented the Director of Sales in connection with the shipment of War Department surplus machines to Belgian manufacturers.

It will be recalled by readers of AMERICAN MACHINIST that shortly after the armistice an agreement was entered into between the Director of Sales and a syndicate of Belgian manufacturers, known as La Construction Metallique, whereby the United States War Department undertook to supply the machine tool requirements of Belgian manufacturers out of its surplus equipment on the basis of 1914 prices plus 55 per cent, less a graded amount for depreciation depending upon the condition of the machines.

An American army officer, Lieut. J. F. Ostertag, a machine tool expert, was assigned to duty with the Construction Metallique to ascertain the needs of the Belgians and under this agreement, approximately 2,200 machine tools were ordered from the War Department and delivered in Belgium during 1920 and 1921. These machines were of great assistance to Belgian industry. The transaction, it can be claimed, was equally advantageous to the American machine tool industry, since it discouraged importations of machines from Germany and introduced into Belgium many makes and types of American machines which might otherwise not have become known there except through years of patient missionary effort.

Ninety Per Cent of Tools Satisfactory

Less than ten per cent of the machines shipped to Belgium were found to be unsuited to the needs of the Belgian manufacturers who specified their requirements. This is a remarkable record when it is considered that the War Department of a government is not supposed to be equipped to carry on a business in a highly technical article like machine tools, and, particularly, when it is considered that the machines in question were probably brought together from plants situated all over the United States, with all the attendant difficulties in the shape of examination, appraisement, inspection, shipment and packing.

The policy adopted by the Director of Sales in the case of machines that did not meet the requirements of the Belgian buyers was a wise and liberal one that reflected great credit both on the United States Government and on the officials who negotiated the transaction and carried it through to completion. All machines that were not satisfactory were taken back by the Government and stored in the American Army Base warehouses in Antwerp. It is this machinery that has just been sold "en bloc" to Mr. Frederick, who plans to dispose of it not only in Belgium, but wherever the market calls for such equipment.

Altogether, about 180 machines are involved in the deal, about half of them being lathes from 16 to 30 in. swing and 6 to 20 ft. beds, the makers' names including Leblond, Whitcomb-Blaisdell, Fulton, Reed-Prentice, Canada, National, Wickes, etc. Next in importance to the lathes are turret lathes, made by Gisholt, Foster, Warner & Swasey, Libby and Steinle. There are also a number of automatics of Gridley, Acme, Cleveland, New Britain and Cone types, and a few grinding machines made by Norton, Fitchburg, Bryant, Diamond, Sellers and Blanchard. The single Blanchard grinder is a No. 16 with motor on spindle, the motor being wound for 60 cycles, whereas the Belgian practice is 50 cycles. There are several sensitive radial drilling machines, made by Carlton and Hammond, but no other types of drilling machines and no milling machines with the exception of two Ingersoll slab millers, two or three hand milling machines, a number of one- and two-spindle profiling machines and several thread milling machines for internal work.

Some Machines Incomplete

Among the miscellaneous machines that complete the list are two 48-in. Putnam planers, a Cincinnati 24 in. x 4 ft. crank planer, several Pratt & Whitney spline milling machines, three or four Toledo and Ferracute presses, a Beaman & Smith two-spindle horizontal boring machine, one Rockford horizontal drilling machine, a No. 60 Heald cylinder grinder and several Pratt & Whitney shaving machines.

Many of the machines are incomplete and will require new parts from America to fit them for work. The 24-in. Gisholt turret lathes, for example, are without side carriages and possess no tools. The Warner & Swasey No. 2 and No. 4 turret lathes are likewise without side carriages and bar feed mechanism. Incomplete machines are, of course, useless to the average machine shop, and as no one in Belgium has up to the present made a practice of reconditioning machine tools it is quite likely that these incomplete machines will eventually have to be sold at very low prices to buyers willing to assume the risk and expense of completing them.

The price at which the machines were sold to Mr. Frederick is not known, but undoubtedly it was based upon the present stagnant condition of trade in Belgium and upon the realization that much of the equipment in its present state is useless except to those prepared to try it with the full knowledge that many parts will have to be made here or imported from the United States. The sale will likewise free the American Army Base warehouses in Antwerp of several hundred tons of cumbersome material and reduce the military operating expenses in that part.

Prior to entering the employ of the Director of Sales of the United States War Department in 1919, Mr. Frederick was president of the Allied Machinery Company de France, of Paris the French subsidiary company of the Allied Machinery Company of America.

Progress Report of Standards Body

Important developments that have taken place in the movement to nationalize engineering and industrial standards are set forth in detail in a report now being issued relating to the work of the American Engineering Standards Committee during 1921.

The activities of the committee have developed to such an extent that work is now under way on seventy nine distinct projects which have reached an official status. In their work, 160 bodies of national importance are co-operating, these having designated more than 500 individuals as official representatives to serve on sectional committees working under the auspices of the committee.

During 1921 the committee approved standards for seventeen different projects. A list of seventy-nine projects remains to be developed during the coming sessions. This list will be supplemented by other standards as soon as the work is systematized.

Among the standards approved during 1921 were: Specifications for portland cement, soft or annealed copper wire, copper wire, bars, cakes, slabs, billets and ingots, electrolytic copper wire bars, etc., cold-drawn bessemer steel automatic screw stock, cold-drawn open-hearth steel automatic screw stock; standard methods of testing distillation of bitumunious materials for road treatment, sampling of coal, assay of copper, chemical analysis of manganese bronze and gun metal; safety codes for protection of heads and eyes of industrial workers, national electric code and industrial lighting code; and a standard test for toughness of rock.

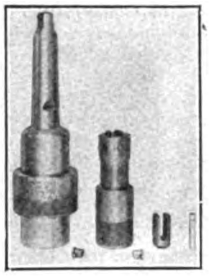
A statistical summary included in the report is interesting. It contains the following data: Member bodies, 20; organizations represented, 28; representatives on main committee, 52; approved standards, 17; standards up for approval, 17; projects having official status, 79; projects for which sponsorship has been accepted, 51; organizations acting as sponsors, 43; co-operating bodies, 160; individuals on sectional committee, 548.

The report also contains a list of the committee members, participating organizations and the constitution and rules of proceedure of the committee.

Condensed-Clipping Index of Equipment

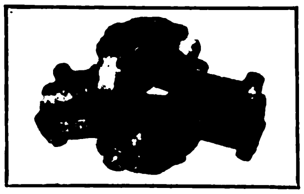
Patented Aug. 20, 1918

Chuck, Drill, Quick-Change, Positive, Safety
SaveAll Tool Co., 59 River St., Waltham, Mass.
"American Machinist," December 1, 1921.



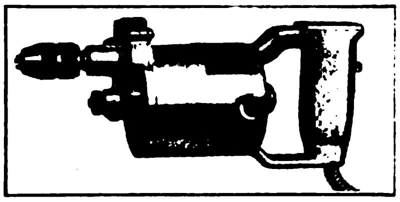
The chuck has a safety device to prevent breaking and burning of drills, taps, reamers and counterbores, and it consists of the chuck body, collet, ejector, shearing pin and jaws. The collet holds the drill and slips into the chuck. It has a solid bearing surface at each end and a lock for automatically taking up wear and eliminating end motion. The ejector in the small end of the collet releases the drill. The collet is driven by a renewable soft steel pin, which shears off when the cutting tool is overloaded. The capacity of No. 2 chuck is ¼ to 2-in. taper-shank drills, i. e., Nos. 1, 2, 3 and 4 Morse tapers.

Joint, Universal, Adjustable, "American"
Hartman Manufacturing Co., 308 Pearl St., Hartford, Conn
"American Machinist," December 1, 1921.



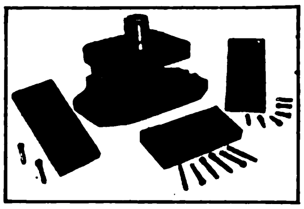
The joint is intended to transmit relatively large powers. A ring surrounds the forks and carries the hardened steel studs, which have tapered bearings in the fork ends. This ring is in two parts, so that the joint may be assembled or disassembled, and adjustments made to compensate for wear. An annular oil chamber within the ring holds a large supply of oil. The sleeves also are split, and may thus be applied to shafts without disturbing the endwise position of the latter. The castings are bronze, but may be supplied in malleable iron or steel. The joint is made in all commercial sizes for shafts from ⅜ to 2 in. in diameter.

Drill, Electric, No. 3
Lovejoy Tool Works, 319-331 West Ohio St., Chicago, Ill.
"American Machinist," December 1, 1921.



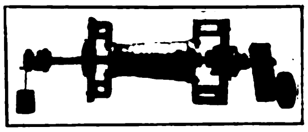
The drill has a capacity for drilling ¼-in. holes in steel. It weighs only 4 lb. and is furnished with either a 110 or 220-volt motor suitable for direct or alternating current. The switch is conveniently placed and is operated by the thumb. The drill has ample ventilation and provision for oiling, and is driven through a bronze gear.

Punch and Die, Standard Sets
Diamant Tool and Manufacturing Co., 91-97 Runyon St., Newark, N. J.
"American Machinist," December 1, 1921.



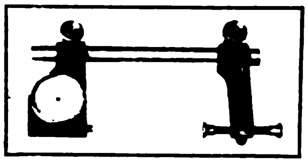
The sets are made in five sizes capable of a large number of combinations, to save the purchaser's time in making patterns and castings. The die sets are furnished complete with the exception of the die openings and the holes for inserting the punches in the punch plate. Screw holes are drilled and countersunk and all screws and dowels required are furnished. The die blanks are of oil-hardened steel and are from 0.006 to 0.010 in. oversize to allow for shrinkage in hardening and for final grinding.

Boring Bar, Taper, Portable
Pedrick Tool and Machine Co., 3638 North Lawrence St., Philadelphia, Pa.
"American Machinist," December 1, 1921.



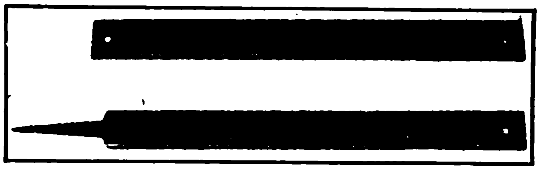
The bar is adaptable to boring holes with any degree of taper, as well as to facing the hub on work too large for a machine. The tool is shown set up for boring a cylindrical casting, that serves as a support for the crossheads holding the boring bar. Each crosshead has four setscrews for adjusting and aligning the bar after centered in the hole. The taper is derived from a cross-slide and yoke, the degree of it being controlled by the distance the slide is moved from the central axis. The driving gear is stationary. The feed case, shown with a weighted handle, provides a constant and automatic feed.

Caliper, Indicating, Extension-Beam
F. W. Horstman Co., 196 Coit St., Irvington, N. J.
"American Machinist," December 1, 1921.



The caliper may be used on a lathe for gaging across the face of chucked work, and on a planer for duplicating wide pieces. By reversing the arms on the beam, the tool becomes an inside indicating caliper, and can be used in any size hole above 4¾ in. The dial is graduated in thousandths of an inch, so that the operator may see directly the size of the work in relation to the desired size. The rear surfaces of the arms are flat, and, when laid on a plane surface, keep the plunger and adjusting screw in alignment. The beam is ordinarily 6 in. long and ⅜ in. in diameter, although any length can be furnished.

File, "Hygrade Hand Miller"
Steele-Sayward Co., 79 Milk St., Boston, Mass.
"American Machinist," December 1, 1921.



The teeth of the file are milled instead of being forced up by the usual process of file cutting. It is claimed that the process of forming the teeth does not harm the grain structure of the steel; that the steel is especially heat-treated to give maximum hardness and toughness to the teeth; that the tool works equally well on all metals and alloys, and that when used on lead, solder or babbitt the teeth do not become clogged. The files can be furnished in either the blade or the tang type.

Hoist, Electric, "LiftAbout"
Shepard Electric Crane and Hoist Co., Montour Falls, N. Y.
"American Machinist," December 1, 1921

The electric hoist is applicable to all load-moving jobs and can be installed wherever a chain block might be used, providing that electric current is available. The motor is especially designed for hoisting service, and can be furnished for either direct or alternating current.

Clip, paste on 3 x 5-in. cards and file as desired

Business Outlook in Foreign Markets

Reports coming to the Department of Commerce from foreign countries provide an accurate barometer of business conditions abroad and indicate to American manufacturers where their best markets lie. Dr. Klein, director of the Bureau of Foreign and Domestic Commerce, at Washington, stated recently that his department is receiving an average of 600 inquiries per week from business men regarding Latin-American markets. This indicates a growing interest in Latin-American business and disproves the reports that Germans have secured these markets to the exclusion of all other countries.

Developments in the Far East are also encouraging. The Shanghai market for steel products is generally quiet but the demand for tin plate and wire nails is noticeable. By the failure of German concerns to deliver steel products according to contract, American firms are placed in a strong position. Contracts which were concluded in China by the Germans last year for the erection of cement plants evidently called for German machinery equipment as quantities of such machinery are now being shipped to that country. German automobiles have also appeared in China, the first since pre-war days.

Competition too Strong

In Australia the Newcastle Steel Works, owned by the Broken Hill Proprietary Co., will be entirely shut down this month. It is said by officials that the production cannot compete with the following steel prices in England and in other countries. Reports are current that the Commonwealth government's merchant marine may be sold to private operators.

The Belgian industrial situation during the past month has been marked by decreased orders, falling prices, wage reductions and increased fuel stocks. The metallurgical and window-glass industries are the most seriously affected. All grades of pig iron have declined 5 francs per ton since Feb. 15. Owing to the reduced foreign demand and somewhat increased production, semifinished steel, both bessemer and open-hearth, have generally declined about 35 francs per ton. Most varieties of finished iron and steel likewise registered reduction varying from 1 to 2 francs per hundred kilos, while under pressure from British and Luxemburg competition the decline on sheets was more marked, ranging from 4 to 8 francs per hundred kilos. American competition in wire nails resulted in reduction of 1s. per hundred kilos in Belgian export prices. On March 1, twenty-two blast furnaces were operating, with a production of 400 tons of foundry iron and 3,215 tons of basic pig per 24 hours. This compares with eighteen blast furnaces in operation on Feb. 1, producing 646 tons of foundry iron and 2,470 tons of basic pig per 24 hours. Of the larger plants, the Ougree-Marihaye has four blast furnaces in operation; Usines de la Providence, two; and the S. A. John Cockerill, two. The latter plant has halted all steel-producing installations and is concentrating on the construction of a large, modern rolling mill which it is hoped to have ready for operation by October. Some of the iron and steel firms are planning to have extensive exhibits at the Rio de Janeiro exposition. A 90-ton express locomotive will be shown by the Cockerill Co.

In Spain the government is expected to refuse the railroads further increases in rates as the earnings have been very satisfactory the past year. The Norte Railroad earned 29,600,000 pesetas in 1921, which will allow a dividend of 57 pesetas per share. This company is issuing bonds for repair and equipment to the amount of 50,000,000 pesetas. In a recent session of the Council of Ministers it was resolved that the government would abandon, after April 1, the practice of extending state aid to the railroads, which during the current fiscal year has averaged about 7,000,000 pesetas a month.

Zeppelin Dirigibles

It is reported that the new dirigibles for the service planned between Spain and South America will be constructed in Spain under the direction of engineers sent by the Zeppelin Co. Aerodrome space has been secured near Seville and near Buenos Aires, and it is expected that within a month work will begin on the sheds. The Minister of War was granted a supplemental credit of 65,834,219 pesetas on Feb. 14. In addition he has solicited a credit of 17,500,000 pesetas for aviation, and it is planned to create ten squadrons with eighteen machines each. In addition six large bombing planes will be secured and necessary hangars constructed. The Minister of Marine is negotiating for the purchase of hydroplanes in England and dirigibles in Italy.

Business Items

The Sandvick Steel Co., Inc., has combined its general steel and steel belt conveyor departments in the one office at No. 2001, Woolworth Bldg., 233 Broadway, New York City. The following officers are now established in these quarters: W. D. Thomas, president and general manager; Anders Johnson, vice-president; G. M. Spencer, secretary; Harry Carlson, sales manager.

The Wunsch & Ter Kuile Company has been organized with offices and warehouses at 302 McDougal St., Brooklyn, N. Y. The new company will act as selling agents for manufacturers of material handling machinery and industrial engineering equipment. Mr. Wunsch is the founder of the Silent Hoist Co., and Mr. Ter Kuile was formerly engineer with the E. I. du Pont de Nemours & Co.

The Weed Engineering Works, Inc., Bridgeport, Conn., was recently incorporated under Connecticut laws to manufacture metal products, tools, machinery and miscellaneous devices. The capital stock is $25,000 and the incorporators are: Fred R. Carstensen, Nichols, Conn.; Lorenz F. Carstensen, 72 Fifth St., Bridgeport; and H. W. Carstensen, of Nichols.

Davis Welding and Manufacturing Co., of Cincinnati, Ohio, manufacturer of truck tanks, storage tanks and seamless cans, has opened branch offices in the American National Bank Bldg., San Francisco. The company will introduce in Pacific Coast territory a standardized truck tank body for carrying gasoline and oil, which body is claimed to posses safety features that largely eliminate fire hazards. C. F. Chambers, Pacific Coast manager for the company, will make his headquarters in San Francisco.

The Columbia Foundry Co., of Columbus, Ga., has been consolidated with the W. L. Lemley Foundry Co., of Bessemer, Ala. The soil pipe plant of the Columbia company is to be moved to Bessemer.

An Interstate Commerce Commission examiner has recommended that the rate on bulk coke from Tupelo, Miss., to Atlanta, Ga., is unreasonable, in deciding the complaint of the Pratt Engineering and Machine Co.

Advances in aid of exports made by the War Finance Corporation from Jan. 4 to March 11 of this year include $470,966 for sugar mill machinery and $500,000 for agricultural machinery.

The Lyons Level and Tool Co., of New Haven, Conn., manufacturer of levels and tools, recently changed the name of the concern to the Lyons Manufacturing Company, and filed a certificate for an increase in capital stock from $50,000 to $150,000.

The Hartford Blower Company, 618 Windsor Ave., Hartford, Conn., has recently filed papers of incorporation with the Secretary of State, to manufacture and deal in blowers and fans. The officers chosen are: President, George W. Christoph; treasurer, Robert A. Briggs; secretary, George W. Christoph, Jr.

The Steel Co. of Canada, Ltd., reports, for the year ended Dec. 31, 1921, a net income of $817,292, which, after deducting preferred dividends, is equal to $3.15 per share on the common stock, compared with a net income of $1,855,-404, or $12.19 per share in 1920.

The plant of the Sinker-Davis Company, of Indianapolis, Ind., manufacturer of boilers, engines and saw mill machinery, was badly damaged by fire recently.

The All-Metal Valve Co., has been organized at Detroit, Mich. Capital stock is $200,000 and incorporators are F. L. Klingensmith, C. Nalinz and F. Beall. Mr. Klingensmith was formerly vice-president of the Ford Motor Co.

The Bernard E. Mohr Machinery Co., of St. Louis, Mo., has moved from Easton Ave. to 1213 Pine St.

The Bryan Harvester Co., Peru, Ind., manufacturer of steam tractors, has bought the real estate and holdings of the Weigle Machine Tool Co., the buildings of which adjoin the harvester company's property. The new property will be used for storage and assembling of tractors. The new tractor recently completed is a three-plow puller, and has 100 horsepower.

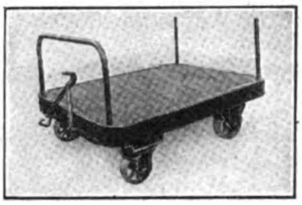
The Tool Equipment Sales Co. has been organized at Chicago, Ill., with sales offices at 18 South Clinton St. Jesse B. Alton and C. B. Cole are the owners. The company now represents the Alvord Reamer and Tool Co., of Millersburg, Pa., and the Standard Saw and Tool Manufacturing Co., of Boston, Mass.

The Edward Hollander Tool Co., 142 Miller St., Newark, N. J., has just been organized to manufacture the Hollander adjustable broach. The product will be sold through dealers as well as direct.

Condensed-Clipping Index of Equipment

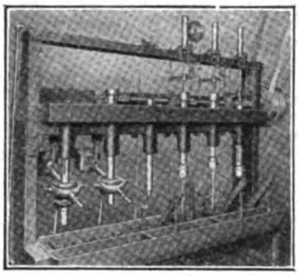
Patented Aug. 20, 1918

Trailer, Heavy-Duty, "Brute"
Sharon Pressed Steel Co., Sharon, Pa.
"American Machinist," October 6, 1921



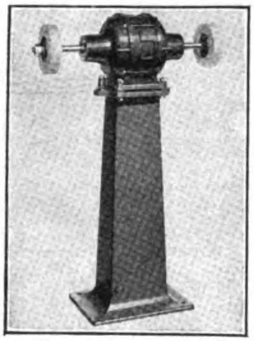
The trailer can be pulled by an industrial tractor or motor truck. It is intended for carrying heavy loads, and cannot be easily tipped. The frame is made of pressed steel, the outer members being 4⅜ in. channels of ⅛ in. steel. It can be made in any length up to 72 in. and width up to 50 in. The rear wheels are made of malleable iron, and have 3 in. Hyatt roller bearings. The front casters are bolted to pressed-steel stampings and equipped with bail and roller bearings. The top is of oak, with the edges placed under the rails. The truck can be equipped with one or two couplers. It weights 362 pounds.

Operator, Nut-Tapping Machine, Automatic, Air-Operated, "Clay"
Key Boiler Equipment Co., East St. Louis, Ill.
"American Machinist," December 8, 1921



The device controls the rise and fall of the spindles and feeds the blank nuts into the tapping position. As soon as a nut is tapped, the spindle and tap are raised, carrying the tapped nut on the tap, and another nut is fed into position and the tap lowered into it. When the tap shank is filled with tapped nuts, the spindle rises to be removed and emptied. The regulating and feeding mechanism take care of all sizes of nuts within the capacity of the machine. This attachment can be applied to all makes of machines.

Grinder, Tool, Electric, "Dimo"
Luther Grinder Manufacturing Co., Milwaukee, Wis.
"American Machinist," December 8, 1921

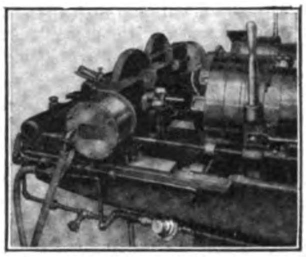


The machine is for use in manufacturing or repair shops where electric current is available. The motor is dust proof, and runs in S.K.F. bearings. The arbor is rigid, and allows considerable space between the bearings and the wheels. Dimo-grit wheels are used. The grinder can be furnished with either a high or low pedestal, and also with toolrack and guards. The machine is built in five sizes with either single-phase motors for 110 or 220 volts, or two or three-phase motors for 110, 220 or 440 volts. It can be furnished for belt drive if desired.

Gages, Plug, Standard, Leonard
Coats Machine Tool Co., Inc., New York, N. Y.
"American Machinist," December 8, 1921

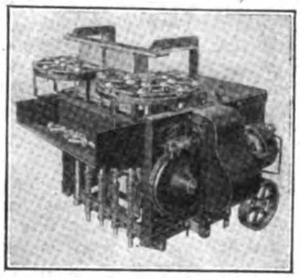
The gages are fitted with renewable heads, are made of hardened steel, and are guaranteed accurate to within 0.0001 in. of nominal size. The No. 1 standard set comprises 14 sizes from ¼ to 1¼ in. The No. 2 standard set comprises sizes from 1⅜ to 2¼ in. Renewable limit plug gages can be supplied in various sizes in English or metric units to any given limits, in sets or singly. Standard ring gages are made from ¼ to 6 in. in size, to cover the same range as the plug gages. Any of the Leonard tools can be supplied.

Operator, Bolt-Cutting Machine, Automatic, Air-Operated, "Clay"
Key Boiler Equipment Co., East St. Louis, Ill.
"American Machinist," December 8, 1921



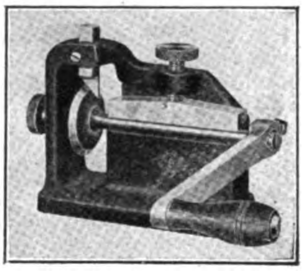
This device can be applied to all makes of machines. It clamps the work, feeds it into the dies, opens the dies after the thread has been cut, returns the carriage to its starting position and closes the dies for the next cut. The finished bolt is ejected from the holder, thrown clear of the machine, and another bolt pushed in from the magazine. When the starting lever is pulled by the operator, the movements are repeated. If the machine has a lead screw, the device can cut a thread with a continuous lead on the opposite ends of a bolt. For threading square or hexagon-head bolts from ⅜ to 1¼ in. in diameter, a special feed and ejector can be furnished.

Heater, Rivet, Electric, Portable
United States Electric Co., New London, Conn.
"American Machinist," December 8, 1921



This machine can be used in shipyards, boiler and car works, and in any steel construction. It is built with two, four, or six electrodes for manual operation, or with an automatic movement for carrying the rivets between the electrodes and discharging them when heated. The automatic machine is illustrated. In the manually operated machine the electrodes are opened by pedals and closed by heavy coil springs. The machine is provided with casters, and with eyebolts for picking it up. It is furnished for 220, 440, or 550-volt, 60-cycle, single-phase alternating current, or may be specially constructed for other voltages and frequencies. It is 33 in. in height, 22 in. in length, and varies in width according to the number of electrodes.

Tool, Valve Facing, Adjustable
New Britain Tool and Manufacturing Co., New Britain, Conn.
"American Machinist," December 8, 1921



This device for resurfacing automobile engine valves will handle poppet valves of any commercial size of stem, and is designed for the use of individual automobile owners. The valve stem rests in a long V-groove and is held down by a flat steel shoe bearing on top of the stem, giving a three-point bearing. The valve is rotated by a crank handle. A screw is used to regulate the pressure on the stem. The removable cutting tool has an edge accurately ground to the original angle of the valve. The upper surface of the valve abuts against the screw at the left, by means of which the valve is fed to the cut.

Wrenches, Socket
Viking Specialty Co., 25 Bartlett St., Worcester, Mass.
"American Machinist," December 8, 1921

The wrenches are put up in sets of various combinations for automobile work. The general service set comprises a double-end ratchet wrench, sixteen sockets for hex-head screws and nuts, three extensions and a handle. The extensions and handle are fitted with ball frictions to prevent the sockets from slipping off. They are also put up in factory sets for shop assembling work, and in owners' sets to fit the bolts and nuts on any particular make of car.

Clip, paste on 3 x 5-in. cards and file as desired

Personals

GEORGE A. DAVIES, formerly with Wickes Bros., Saginaw, Mich., is now in Los Angeles. He is looking for good lines of machine tools to represent in the Western territory. At present he may be reached at 1031 S. Gramercy Drive.

P. R. HOOPES has severed his connection with the Automatic Machinery and Equipment Co., of Philadelphia, Pa., and is now associated with Lorenz & Lorenz, of Hartford, Conn., as mechanical engineer.

FRED MATHEWS, formerly vice-president of the Union Metal Products Co., has been appointed general railway sales representative of the A. O. Smith Corporation, manufacturer of pressed steel products, of Milwaukee, Wis.

O. B. ILES, general manager and treasurer of the International Machine Tool Co., Indianapolis, Ind., has been elected president of the Indianapolis Chamber of Commerce. Mr. Iles recently served as chairman of the committee on revision of the constitution of the National Machine Tool Builders' Association.

J. C. MILLER, manager of the Columbus, Ohio, division of the American Rolling Mill Co., has been transferred to Ashland, Ohio, as manager of the Ashland division. The Ashland Iron and Mining Co. was recently taken over by the American Rolling Mill Co. In a recent organization of the Ashland Coal and Iron Railway Co., also owned by the American Rolling Mill Co., Mr. Miller was elected first vice-president and general manager.

ELMER W. DE VED has been appointed manager of the stock department of the Yale & Towne Manufacturing Co., Stamford, Conn. Mr. De Ved has been with the company since 1897.

F. G. VALPEY, has recently accepted a position as sales manager of the Kenloc Manufacturing Co., Providence, R. I., manufacturers of special machinery and roll covering equipment. Mr. Valpey, was formerly sales manager of the Frank Mossberg Co., Attleboro, Mass.

JOHN F. TINSLEY, vice-president and general manager of the Crompton & Knowles Loom Works, Worcester, Mass., returned to this country recently after a two months' tour of the European countries. Mr. Tinsley, was accompanied by Irving H. Verry, also a vice-president of the Crompton & Knowles Co.

HENRY C. M. THOMSON was re-elected president of the American Hardware Co. at the annual meeting of the stockholders, held last week in New Britain, Conn.

CHARLES GLOVER has resigned as first vice-president of the American Hardware Co., New Britain, Conn., after serving that concern for forty years.

HOWARD S. HART has been elected to the board of directors of the New Britain Machine Co., New Britain, Conn. Mr. Hart is chairman of the board of the Hart & Cooley Manufacturing Co., and also of the Fafnir Bearing Co.

FRED W. HOWE, vice-president and sales manager of the Crompton & Knowles Loom Works, loom manufacturers of Providence, Worcester and Philadelphia, has booked passage for a three months' business trip in China and Japan.

CHARLES F. MARBLE, treasurer of the Curtis & Marble Machine Company, textile machinery manufacturers, Worcester, Mass., was recently elected a member of the executive committee of the Worcester branch of the National Metal Trades Association.

HENRY F. FAVOR, superintendent of the Providence, R. I., plant of the Crompton & Knowles Loom Works, sailed for China on March 16.

SYDNEY R. MASON, secretary of the Whitin Machine Works, Whitinsville, Mass., has sailed from San Francisco for a trip to Japan. Mr. Mason plans to return to this country in June.

J. H. WINDLE, sales agent of the Woonsocket Machine and Press Co., textile machinery manufacturers, of Woonsocket, R. I., has returned to this country after a six months' business trip in Japan and China.

W. C. MURPHY, treasurer of the Providence Mill Supply Co., Providence, R. I., returned to this country last week, after a six months' business trip in China and Japan.

Catalogs Wanted

Horace L. Smith & Co., Inc., Petersburg, Va., would be pleased to receive catalogs on wood-working machinery, lathes, shapers, drilling machines, power hacksaws and other metal-working machines for handling metal up to ½ in. thick. The company is building a plant for manufacturing farm machinery and implements. Catalogs should be sent to Horace L. Smith, Jr., 1009 So. Sycamore St., Petersburg, Va.

Lefax, Inc., 9th and Sansom Sts., Philadelphia, Pa., would like to receive catalogs on all kinds of engineering materials and equipment.

Book Reviews

Proceedings of the Twenty-fourth Annual Meeting of the American Society for Testing Materials. Published by the society. Paper $10; cloth $11, and half leather $12.50; 1,197 pages 6 x 9 in.

In addition to the annual address of the president, George S. Webster, and the reports of thirty-one standing committees on various materials, the book contains tentative standard specifications for ferrous and non-ferrous metals; cement, lime, gypsum and clay products. Also for miscellaneous materials such as preservative coatings, petroleum products, lubricants, road materials, coal, coke, insulating materials, shipping containers, rubber products, and textile materials. The twenty-four papers presented at the meeting are given in full, together with discussions by various members. These papers contain valuable information on the results of investigations by experts in the field of engineering materials.

A Course in Mechanical Drawing. By Louis Rouillion, B.S., A.M., director Mechanics Institute, New York City. Norman W. Henley Publishing Co., 2, 4 and 6 West 45th St., New York. Cloth, ninety-two 6⅝ x 7½-in. pages, thirty-five illustrations, $1.50 net.

This book is the result of a number of years' work in the instruction of evening classes and is intended for the use of students either at school or at home. The course covers a period of two school years of about twenty-four weeks each. As may be expected, the subjects are treated in an elementary way. Under the head of instructions a list of drawing materials and instruments required, their prices and use are given. The illustrations cover lettering, projection and isometric drawings all of which are accompanied by concise explanations and instructions. Under the head of notes on working drawings, directions are given for size of drawing sheets, titling, making sketches, laying out work, relation of views, sectioning, inking, dimensioning and blueprinting.

Report of the Fourteenth Annual Conference on Weights and Measures. Miscellaneous Paper No. 48, of the Bureau of Standards, Department of Commerce, S. W. Stratton, director. Complete copy of the paper may be purchased from Superintendent of Documents, Government Printing Office, Washington, D. C. Price, 20 cents.

This publication, a verbatim report of the conference, contains addresses by the Secretary of Commerce, the president of the conference, and others. The papers and discussions deal with liquid-measuring devices, mine scales, railroad weighing of coal, and the metric system. Specifications and tolerances for liquid-measuring devices as amended are contained in the appendix.

Forthcoming Meetings

National Metal Trades Association: Annual convention April 17 to 20, Hotel Astor, New York City. H. W. Fisher, 1022 Peoples Gas Building, Chicago, Ill., secretary.

American Gear Manufacturers' Association: Sixth annual meeting, Buffalo, N. Y., April 20 to 22. Secretary, F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Southern Supply and Machinery Dealers Association: Annual meeting, Birmingham, Ala., April 24 to 26. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, A. M. Smith, c/o Smith-Courtney Co., Richmond, Va.

National Machine Tool Builders' Association: Spring convention, Hotel Traymore, Atlantic City, N. J., April 25 and 26. Ernest F. DuBrul, 817 Provident Bank Bldg., Cincinnati, Ohio, general manager.

National Research Council: Annual meeting of executive board, April 26, Washington, D. C. A. D. Flinn, 29 West 39th St., New York City, chairman.

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York City, May 8, 9 and 10. Secretary, George Boudinot, 50 Church St., New York.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

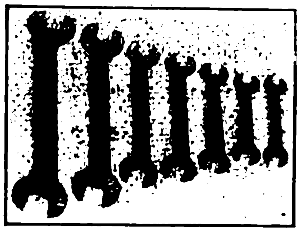
Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

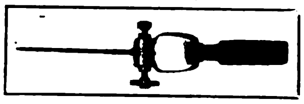
Patented Aug. 20, 1918

Wrenches, Double-End
Mechanics Tool Co., Rockford, Ill.
"American Machinist," December 8, 1921



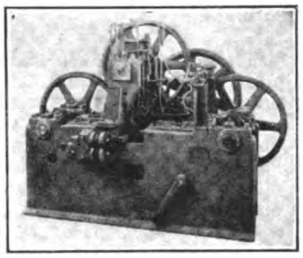
These wrenches are drop-forged from tool steel and oil tempered. The angle of the jaws makes it possible for the user to work in tight places and secure a firm hold on the nut or screw head without slipping. The opening in the larger end of each wrench is of the correct size to fit a U.S. standard nut, while the small end is made to fit an S.A.E. standard nut or bolt head. This feature makes the wrenches useful to the automobile mechanic. The set covers fourteen sizes of openings without duplication.

Vise, Hand, Pin
Coats Machine Tool Co., Inc., 110 West 40th St., New York, N. Y.
"American Machinist," December 8, 1921



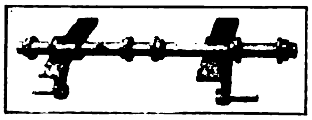
The upper part of this device consists of a flat lyre-shaped spring and two movable jaws, both held together by a frame fitted with the clamping screw and knurled adjusting screw. These screws are provided with hardened pin ends, which project into the jaws and prevent them from sliding. A straight or tapered piece or one of irregular section, is gripped rigidly along the entire length of the jaws when the clamping screw is tightened. Long pieces extend through the hollow handle and are centered by means of the knurled adjusting screw.

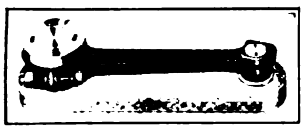
Nut Pressing Machine, Hot, Automatic
Acme Machinery Co., Cleveland, Ohio
"American Machinist," December 15, 1921



A heated bar of special section is used, and the first operation indents it on both sides. The cut-off slide advances, shears off the blank and carries it into the die box. Two punches advance from opposite sides and go part way through the blank, compressing it in the center. The short punch retreats, while the piercing punch advances and punches out the core; and the nut is then ejected from the die. The machine is equipped with an automatic relief device. The indenting tools are operated from the upper shaft while the punches and cut-off slide are operated by the shafts at the opposite ends of the machine. The machine is built in four sizes: ⅜ to ⅝ in., ½ to 1 in., ¾ to 1½ in. and 1 to 2 in. The number of strokes per minute varies from 70 or 75 for the smallest to 35 or 40 for the largest machine.

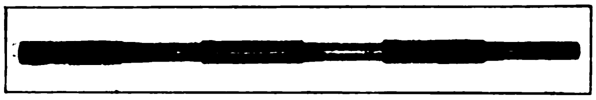
Babbitting Fixtures, Ford Automobile Engine
New Britain Tool and Manufacturing Co., New Britain, Conn.
"American Machinist," December 15, 1921





The two fixtures are intended for repairing the main bearings and connecting rods of Ford engines. The main bearing fixture, shown in the upper view, can be set in place on the inverted cylinder block and positioned by the studs in the camshaft bearings. Crossbars hold the arbor central with relation to the bearings. The under-sized arbor allows stock for finish reaming the bearings. The connecting-rod fixture, shown in the lower view, consists of a flat base block of cast iron with two vertical studs and collars. The wristpin end of the rod, placed over the smaller stud, brings the crank end in proper relation to the larger stud, which is the babbitting arbor. The upper collar, pushed over the projecting end of the stud, bears against the rod. Recesses in the collars take care of the fillets. The bearing is finished when taken from the fixture.

Reamer, Line, Ford Crankshaft Bearing
New Britain Tool and Manufacturing Co., New Britain, Conn.
"American Machinist," December 8, 1921

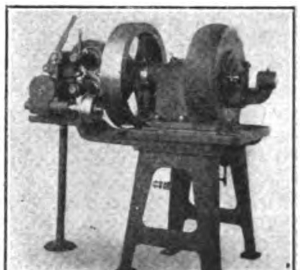


This line reamer is especially constructed for reaming the crankshaft bearings of Ford automobile engines, and employs the same principle of expansible diameters and pilot blades as other reamers made by the concern. The blades are ground to a true circle for a distance equal to about one-third of their length from the entering end. This diameter follows the hole left by the babbitting fixture in the newly babbitted bearings. The range of expansion is from normal to about 1/32 in. oversize.

Drilling and Tapping Machine, Upright, "Electro-Magnetic"
W. Gaterman Manufacturing Co., Manitowoc, Wis.
"American Machinist," December 15, 1921

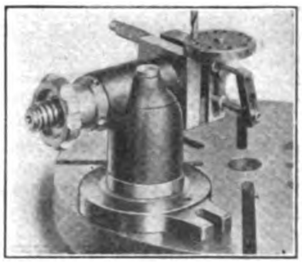
By this machine hand tapping can be automatically imitated. The tap is held in a floating spindle, which is driven through two coil springs, to avoid shocks and jars on the tap. The spindle automatically reverses for one-sixth of a turn when too great a torque is transmitted, and immediately takes up its original speed, which varies from 300 to 2,000 r.p.m., according to the size of the tap. The reversing action is accomplished by the spring balance in the drive and by electro-magnets. The machine can be furnished in different sizes, the No. 4 size having a range up to ½ in. Either belted or motor drive can be employed. The machine can be set so as to run the tap to a certain depth and automatically return it.

Swaging Machine, Roller-Cage Type
Langelier Manufacturing Co., Arlington, Cranston, R. I.
"American Machinist," December 15, 1921



In this machine the rolls are carried in a floating ring or cage instead of being fixed in the head, and are made of a tempered carbon steel. A similar roll is carried in the outer end of each hammer block. A roll feeding attachment is mounted on the machine, to withdraw the work with a slow, even motion and give straightness and uniformity of reduction. The attachment has a capacity for stock from 0.375 to 1.313 in. in diameter. It is movable to and from the head through a distance of 5 in. by means of a screw underneath the baseplate. The flywheel is held to the spindle by a two-bolt clamping hub, closing over a key.

Vise, Combination, Drill Jig, Milling Fixture, Swiveling, Victor
W. B. U. Tool Co., 104 Harding St., Worcester, Mass.
"American Machinist," December 15, 1921



The device holds the work on a drilling machine, shaper, grinding machine or milling machine. The vise can be swung to change the position, both horizontal and vertical swivels being graduated to 360 deg. The fixture can be used on the bench when filing small dies and punches; or as a drill jig, for which it is equipped with a bushing plate having eighteen holes varying from 7/64 to ⅝ in. in diameter. It can be set to drill round stock from 1/16 to 1 in. in diameter, and square or flat stock from ¼ to 1 in. thick. A V-groove is provided for the gripping of cylindrical work. The jaws have an opening of 2½ in., and can be furnished either soft or hardened.

Clip, paste on 3 x 5-in. cards and file as desired

The Weekly Price Guide

THIS WEEK'S MARKET

THE quotation of $1.40@$1.45 for structural shapes, plates and mild steel bars has very nearly disappeared from the market; leaving $1.50 per 100 lb. as the official Pittsburgh mill price. The gradual stiffening of the mill price has not as yet been reflected in warehouse quotations. Chicago warehouses, however, quote floor plates at $4.98 as against $3.40 per 100 lb.; but announce reductions of 25c. per 100 lb. on cold finished steel products. Pig iron, No. 2 foundry, shows slight upward tendency in price.

Electrolytic copper is quoted in New York warehouses at 13½c. as against 13⅝c.; tin at 29⅝c. reduced from 30¼. and lead at 5⅒c. as compared with 5c. per lb., one week ago. Zinc market steadier with quotations unchanged. Chinese antimony quoted in Chicago at an advance of ½c. per lb. Solder quoted in New York at drop of 1c. per lb. and babbitt metal also slightly reduced owing to recent declines in the tin market. Prices on old metals (non-ferrous) down about ½c. per lb. in Chicago.

Linseed oil is quoted at 82c.@83c. as against 83c. in New York; at 90c. reduced from 97c. per gal. in Chicago.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$20.50
Northern Basic	21.02
Southern Ohio No. 2	21.54
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.16
BIRMINGHAM	
No. 2 Foundry	15.78
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil.	21.34
Virginia No. 2	27.74
Basic	21.00
Grey Forge	20.50
CHICAGO	
No. 2 Foundry local	20.00
No. 2 Foundry, Southern, sil 2.25@2.75	21.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	19.00
Basic	18.00
Bessemer	19.50

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	9.0	5.5	2.65
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	16.0	7.5	2.5
Denver	8.0	6.0	5.0
New Orleans	9.0	6.0	4.0
Minneapolis	9.0	6.0	4.5
New York	9.0	6.0	3.0
Cincinnati	5.0	4.5	3.75
Cleveland	6.75	4.5	2.6

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

	Pittsburgh. Large Mill Lots	New York	Cleveland	Chicago
Blue Annealed				
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	3.75@3.90	3.75	4.15
Nos. 12 and 14.	3.10	3.85@4.00	3.85	4.25
Nos. 17 and 21.	3.40	4.15@4.30	4.15	4.55
Nos. 22 and 24.	3.55	4.30@4.45	4.30	4.70
No. 26	3.70	4.45@4.60	4.55	4.85
No. 28	4.00	4.75@4.90	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.56	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	4.98
Cold finished shafting or screw	3.35	3.00	3.15
Cold finished flats, squares	3.85	3.50	3.65
Structural shapes (base)	2.48	2.31	2.38
Soft steel bars (base)	2.38	2.21	2.28
Soft steel bar shapes (base)	2.38	2.21	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.48	2.31	2.38
Bar iron (2.00@2.10 at mill)	2.38	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/32	8.50		12@13
⅛	7.15		11@12
5/32 to ¼	6.75		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.50
Tin, 5-ton lots, New York	29.62½
Lead (up to carlots), St. Louis, 4.75; New York	5.10
Zinc (up to carlots), St. Louis, 5.02½; New York	5.37½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.00	6.50	6.25
Copper sheets, base	19.50@20.50	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.25	15.00	15.75
Brass wire (carlots)	16.75	16.50	.....
Zinc sheets (casks), (8% dis. carlots)	10.50	8.75	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (caselots)	18.00	22.00	19.00
Babbitt metal (best grade)	30.80	41.00	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS--Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	10.00	9.25
Copper, light, and bottoms	8.50	8.50	8.25
Lead, heavy	3.75	3.50	3.65
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.00
Brass, light	4.25	4.25	4.75
No. 1 yellow brass turnings	5.00	5.00	5.00
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb.	.055@.09	.09	.09
Wiping cloths per M., 13½x13½	....	50.00	55.00
Wiping cloths per M., 13½x20½	....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb.	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.82@.83	1.06	.90
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1 00
Coke, prompt furnace, Connellsville		per net ton	$3.50
Coke, prompt foundry, Connellsville		per net ton	4.75

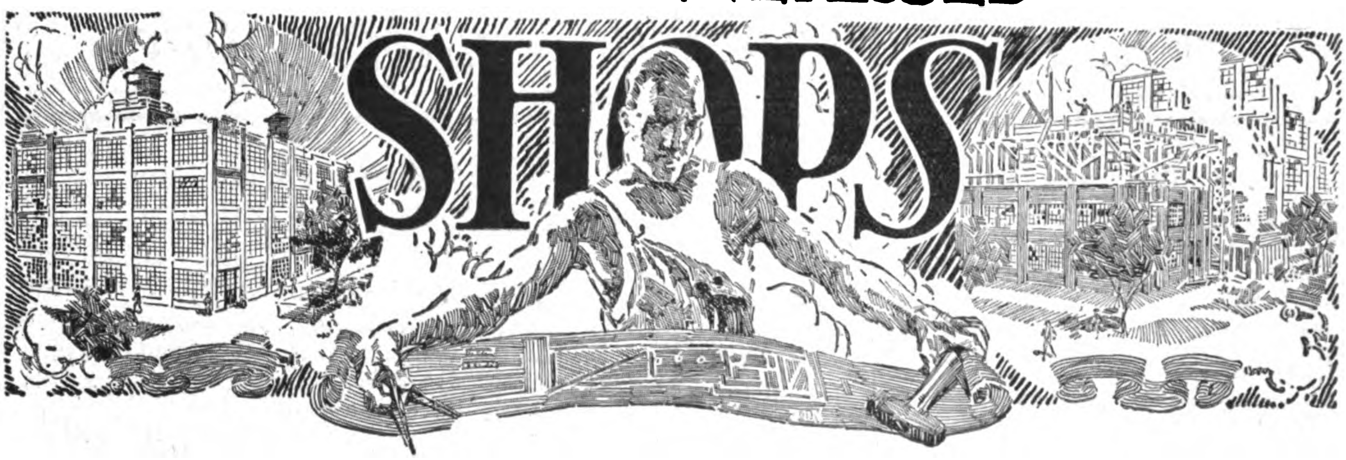
SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60-5%	60-10%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	....	65-5%
Lag screws, coach screws	65%	....	65-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	....	55%
Tap bolts, hex. heads	25%	....	.....
Semi-finished nuts ⅝ and larger	75%	75-10%	80%
Case-hardened nuts	65%	....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.35	$3.25	$3.00
Cone heads, ditto (net)	3.45	3.35	3.10
1¼ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	....	0.15
⅝ in. diameter *EXTRA*	0.15	....	0.15
½ in. diameter *EXTRA*	0.50	....	0.50
1 in. long, and shorter *EXTRA*	0.50	....	0.50
Longer than 5 in. *EXTRA*	0.25	....	0.25
Less than 200 lb. *EXTRA*	0.50	....	0.50
Countersunk heads *EXTRA*	0.35	......	$3.35 base
Copper rivets	60-5%	50%	50-10%
Copper burs	40%	50%	......

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50-5%	60-10%
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	35%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

NEW and ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Conn., East Hampton—M. H. Hill Brass Co.—one No. $1\frac{1}{2}$ geared bliss straight side double action cam drawing press.

Fla., Orlando—L. D. Wylly—portable conveyor to load sand into cars, equipped with gas engine to run on tracks.

Ga., Rome—The Rome Stove & Range Co., J. M. Berry, Pres.—complete foundry equipment including tumblers, grinding wheels, lathe, cupola, etc.

Ia., Dubuque—The Adams Co., 295 6th St.—one sheet steel brake for 10 gauge.

Ill., Chicago—The Illinois Copper & Iron Mfg. Co. 1830 West Grand Ave.—spinning lathe, 26 in. swing, (used).

Ill., Chicago—The U. & J. Carburetor Co., 510 West Van Buren St.—No. 4 and No. 1 Foster hand screw machines; $\frac{7}{8}$ in. Gridley automatic screw machine; No. 2 high speed riveting hammer; punch presses equivalent in size to No. 1 Walch up to Loshbaugh Jordan No. 4; engine lathes; heavy duty type single spindle drills; No. 4 Bardons & Oliver turret lathes; Size 0 Brown & Sharpe automatic screw machines; Avery single and multiple spindle drills; heavy and high speed presses; disk grinder; wheel press; small shapers; Leland Gifford four spindle high speed drill presses; Cincinnati milling machines; 16 in. Arbor presses; Rockford single spindle heavy duty press; air compressors.

Ill., Chicago—The Vulcanizing Material Mfg. Co., 1423 West Van Buren St.—one electric knife, ac. 220 volt.

Kan., Hutchinson—E. C. White, 28 East Bigger St.—one Grays sheet metal cutter for 16 gage with deep throat for odd shaped cutting. Could use machine for heavier cutting.

Kan., Waverly—E. Hoffer—machinery for job printing shop.

Ky., Jeff—The Equitable Lumber & Supply Co., L. Picklesimer, Pres.—woodworking machinery, electric pumps, also carload lots of Southern pine lumber for stock.

Ky., Mayville—The Ohio Valley Pulley Wks., Inc., Central Ave., Main and Chester Sts., E. Gardner, Purch. Agt.—round broaches, all sizes, (used), address Box 288.

La., Baton Rouge—The Capital Feed Mfg. Co., P. O. Box 117, L. S. Doherty, Mgr.—feed mixing machinery, hay cutting machinery, coolers and other feed mill equipment.

Mass., Northampton — McCallum Silk Hosiery Co., 377 Dwight St.—new machinery for hosiery mill at Phila., Pa.

Mich., Bay City—The Garber Machine Co., 3004 North Water St., F. Garber, Mgr.—internal cylinder grinder, similar to Whitney, (new or used), also a screw arbor press about 24 in. between jaws, with a capacity of about 20 ton.

Mich., Benton Harbor—Baker-Vawter Co., D. F. Haddord, Purch. Agt.—one 4 roll angle straightener.

Minn., Deerwood—E. Groth—woodworking machinery.

Minn., Minneapolis—The Despatch Mfg. Co., 120 1st Ave., N., electric ovens, A. E. Grapp, Purch. Agt.—punch presses; angle iron shears; high speed power hack saw; serpentine slitting machine.

Minn., Minneapolis — The Minneapolis Crushed Stone Co., 529 Metropolitan Bank Bldg., A. D. Hoar, Pres.—machinery for washing, drying and crushing plant.

Minn., Minneapolis—The Norwegian Lutheran Deaconess Hospital, 2312 15th Ave. S.—power laundry equipment for proposed laundry.

Minn., Minneapolis—The Standard Material Co., Plymouth Bldg., L. L. Quist, Secy.—machinery equipment for washing and screening plant, daily capacity 1,500 ton; probably a pumping plant equipped with modern screens and belt conveyors, drag line, locomotive cranes.

Miss., Gulfport—The Daily Herald, G. L. Money, Purch. Agt.—7 column press.

Mo., Carthage—The Juvenile Shoe Corp.—shoe making machinery for proposed factory on Main St., Pierce City.

Mo., Jefferson City — The Automatic Water Pump Mfg. Co., 236 A East High St., B. A. Divers, Secy. and Asst. Treas.—receiving bids for machine tools, including lathes, drill presses, brass and aluminum furnaces, woodworking machinery, castings, etc.

Mo., Joplin—The Amer. Sign Wks., 117 North Main St., R. Barker, Purch. Agt.—power band saw.

Mo., Joplin—The Forsythe Mfg. Co., 319 East 3rd St., manufacturer of automobile bodies, A. H. Forsythe, Purch. Agt.—lathe.

Mo., Joplin—The Joplin Radio Shop, $422\frac{1}{2}$ Main St., J. Graber, Mgr.—drill press.

Mo., Joplin—The Modern Trunk Factory, 115 West 5th St., E. Weeks, Mgr.—rip saw and planing machinery.

Mo., Joplin—The Moss Rowe Furniture Co., 115 West 9th St., W. L. Moss, Purch. Agt.—woodworking machinery, band saw and lathe.

Mo., Kansas City—The North Mehornay Warehouse, 1019 Charlott St.—band saw.

Mo., St. Louis—F. E. Palmer Supply Co., Ry. Exch. Bldg.—one air compressor.

Neb., Lincoln—The Capitol City Tire Co., 235 South 11th St., A. L. Brown, Purch. Agt.—Weaver tin tools.

Neb., Lincoln—A. E. Gesse, 404 South 11th St.—one 20 in. lathe.

Neb., Lincoln—S. Knisley, 508 North 19th St.—sole stitching machine, prefer a No. 12 Landis or a Champion curved awl machine.

Neb., Lincoln—The Weston Tire Co., 241 South 11th St., P. P. Weston, Purch. Agt.—electric tire mold.

Neb., Lincoln—The Wolff Cycle Co., 1933 O St., motor-cycle repair shop, W. Wolff, Purch. Agt.—small lathe and drill press, electrically driven.

N. J., Gloucester—The Gloucester Sanitary Milk Co.—conveyors and large capacity automatic bottle filling machines.

N. Y., Albany—F. A. West Co., Inc., 5 Main St., D. D. Blewer, Purch. Agt.—printing presses and book binding machinery and equipment.

N. Y., Bath—D. M. White, Savona Rd.—five or 10 gal. capacity ice cream freezing machinery and 6 tubs and cans.

N. Y., Binghamton—Broome County Supervisors, J. R. Jewell, Purch. Agt.—lathe, miller, drill press, compressor and tank for county repair shop.

N. Y., Binghamton—E. T. Gaige, State St.—machine tools for motor repair including internal grinders for cylinders.

N. Y., Binghamton—H. Monroe, 192 Water St.—one motor driven air compressor with tank also a small lathe suitable to mount wire brushes for rubber scarifying, (used).

N. Y., Buffalo—D. Calabuse, 655 Ellicott St.—sheet metal roller and folder, both 30 in., also edging machine and power punch.

N. Y., Buffalo—The Stewart Motor Corp., 93 Dewey Ave.—power punch press or bar cutter, capacity $\frac{1}{2}$ in. by 5 in.

N. Y., Canandaigua—The Tobin Sash Co. is to change its gasoline power to electrical power and is open for quotations and literature on electric power.

N. Y., Elmira—The Federal Radio Laboratories Inc., C. E. Johnson, 403 West 1st St., Purch. Agt.—machine tools and equipment for the manufacture of small metal electrical parts, also electrical testing equipment.

N. Y., Endicott—The Magic City Ice Co.—ice manufacturing machinery for new plant now in course of construction.

N. Y., Gasport—The Wickwire Limestone Co.—rock handling, crushing, screening and storing machinery and equipment also special equipment for the manufacture of agricultural lime.

N. Y., Gloversville—A. J. Bachman Co., Inc.—four or five $3\frac{1}{2}$ in. knitting machines.

N. Y., Holland Patent—The Bd. Educ., D. B. Lisle, Purch. Agt.—machine tool equipment for vocational department.

N. Y., Long Island City—The Wappler Electric Co., Harris Ave., A. Verhols, Purch. Agt.—one disc grinder, 18 in.-24 in. disc.

N. Y., Nassau—Prior & Williams—adjustable iron rip saw table.

N. Y., Rochester—W. A. Gengenbach, 29 Strathallen Park—several Cleveland automatics Model A No. 1, spindle drive, $\frac{3}{8}$-$\frac{1}{2}$ in.-$\frac{5}{8}$-$\frac{7}{8}$ in.-$\frac{7}{8}$-$1\frac{1}{4}$ in. (used but must be 95% new).

N. Y., Rochester—The Rochester Y. M. C. A., H. P. Lansdale, Genl. Secy.—machine and woodworking tools, also shop tools and equipment for vocational classes.

N. Y., Smithboro—Ockerman & Withey, B. J. Withey, Purch. Agt.—woodworking tools and equipment.

N. Y., Warsaw—G. Scott—complete small jobbers printing outfit with machinery.

N. Y., Watertown—O. B. Cornwell, 422 East Flower Ave.—one iron adjustable saw table with carrier.

N. Y., Watertown—Kops Bros. Inc., Water St., A. Fried, Purch. Agt.—shafting, hangers and special machinery for the manufacture of corsets (individually motor driven).

N. Y., Waverly—R. Perry—machine tools for motor repairing.

N. C., Asheville—The Biltmore Industries—one 36 in. Goddard Burr picker mixing machine.

N. C., Old Fort—The Old Fort Mills, D. W. Adams, Mgr. and Pres.—machinery for 8,000 spindle yarn mill, (new or used).

N. C., Pinetops—The Pinetops Milling Co., P. O. Box 65, J. H. Saunders, Mgr.—$11,000 to $12,000 worth of roller mill and meal mill machinery, also crude oil engine, (new or used).

O., Akron—H. L. Sutton, 1049 Diagonal Rd.—one 10 x 10 air compressor with tank; two moulding machines; one 10 ton crane, 20 to 30 ft. span; one electric hoist.

O., Cincinnati—The Clifton Pratt Co., 1224 West 8th St., A. E. Clifton, Purch. Agt.—one No. 12½ or 13 Toledo punch press or No. 39 Bliss with 1½ in. stroke.

O., Cincinnati—The Economy Mchy. Co., 428-30 East Pearl St.—J. H. Flynn, Sr., Purch. Agt.—caterpillar tractor shovel with ¾ cu.yd. bucket; complete revolving 9 x 16 in. jaw crusher.

O., Columbus—The Columbus Builders Supply Co., Front and Long Sts., W. F. Kern, Secy.—sand and gravel handling machinery and coal handling equipment.

O., Toledo—J. Myers, 1958 Glendale Ave.—linotype machine for job printing plant.

O., Youngstown—The Bd. Educ., 16 West Wood St.—quantity of various machine tools and equipment for Rayen High School manual training division.

Pa., Brookville—The Bd. Educ., Boro of Corsica and Union Twp., c/o S. C. Beeman, Secy., R. D. No. 4, Brookville—equipment for vocational department and mechanical engineering shops.

Pa., Chester—The Chester Dairy Supply Co., 9th and Hyatt Sts.—equipment for metal working shop.

Pa., Corry—The Corry-Jamestown Mfg. Corp., manufacturer metal furniture—Bliss press and Stiles punching press 4 in., (used).

Pa., Monongahela—The Coshocton Iron Wks., Axleton St.—one 10 ton, one 5 ton and two 2 ton cranes.

Pa., Phila.—The Alva Carpet & Rug Co., Kinsey and Hedge Sts.—looms, throwing frames, twisters, shafting, belting, machine shop equipment, etc.

Pa., Phila.—The Cambria Silk Hosiery Co., A and Cambria Sts., L. Weber, Purch. Agt.—quantity of full fashion automatic hosiery machines, dryers, throwers, twisters, belting, shafting, etc.

Pa., Phila.—The Dept. Pub. Heath, Room 584, City Hall—W. S. Twining, Dir.—one milling machine, geared head high power.

Pa., Phila.—The United Tapestry Mills, Erie Ave. and Amber St.—looms and weaving machinery for new factory.

Pa., Pittsburgh—J. F. Casey Co., Union Arcade—one 5 ton and four 2 ton cranes.

Pa., Pittsburgh—H. J. Heinz Co., 1062 Main St., pickles, preserves, etc.—lathe, drill press, grinder and hack saw.

Pa., Rural Valley—The Advance Newspaper, H. C. Peters, Purch. Agt.—linograph machine.

Pa., Wellsboro—L. B. Marvin—machinery and equipment for proposed planing mill on Tioga St.

S. C., Andrews—The Andrews Mfg. Co.—machinery for the manufacture of slack barrel staves, headings, etc.

S. C., Charleston—The Woodstock Mfg. Co., Center St., J. F. Williams, Pres. and Mgr.—complete line of machinery for the manufacture of fibre cases, containers, etc.

Tenn., Chattanooga — The Davenport Hosiery Mills, 906 Georgia Ave.—hosiery winding machine, Altemus make preferred.

Tex., Beaumont—The Brooks Supply Co., 799 Franklin St.—additional machinery for machine shops.

Tex., Gainesville—C. H. Leonard—printing press and folder.

Tex., San Angelo—C. B. Metcalfe & Son—complete machinery for the manufacture of brooms.

Va., Norfolk—The Atlantic Iron Wks., Water St., F. H. Masi, Pres. and Mgr.—machine shop equipment.

W. Va., Weston—The Independent Publishing Co., R. A. Hall, Purch. Agt.—one 8 x 10 job press and mitering machine.

W. Va., Wheeling—The Construction Dept., 51 16th St.—one vertical electric blue print machine, 220 volts, 60 cycle, a.c. preferably a Pease style J. P.

W. Va., Wheeling—The Wheeling Steel Corp., Wheeling Steel Corp. Bldg.—shapers, milling machines and lathes.

Wis., Cudahy—L. Odry, 1211 Packard Ave.—gas storage tanks and pump.

Wis., Fond-du-Lac—The Hurcum Fuel Co., 35 West 1st St., will open bids about April 10 for machinery, equipment, concrete, etc., for four storage elevators, about 1,000 ton capacity.

Wis., Kenosha—The W. J. Pine Machine Co.—one 30 in. x 8 ft. and one 24 in. x 6 ft. planer; five engine lathes, one 12 in. x 4 ft., two 14 in. x 6 ft., one 16 in. x 6 ft. and one 20 in. x 8 ft.; one 24 in. power feed drill; one drill grinder; one 2 in. hard screw machine; one No. 2 milling machine; one 24 in. shaper and one Universal grinding machine.

Wis., Ladysmith—F. Zachek—blacksmith shop equipment.

Wis., Madison—G. Nelson, 117 West Johnson St.—automobile repair equipment.

Wis., Madison—The Pennsylvania Oil Co., 731 East Washington St.—tanks, pumps, vats, etc.

Wis., Madison—J. Werth, 542 State St.—shoe repair machinery.

Wis., Manitowoc—A. M. Richter Sons Co., South 8th and Madison Sts.—storage tanks, fermenting tanks, generators, presses, etc., for proposed cider vinegar plant.

Wis., Merrill—C. Kuehl—one 30 in. to 32 in. band saw; 4 in. to 6 in. planer; medium size shaper; sander; glue pots.

Wis., Milwaukee—The Blochowiak Dairy Co., 1364 4th Ave.—additional dairy equipment including separators and churns, power driven.

Wis., Milwaukee—J. J. Czaja, 901 Holton St.—ice making and refrigeration machinery.

Wis., Milwaukee—The Delta Mfg. Co., 911 5th St.—small milling machine.

Wis., Milwaukee—J. Hack, 1217 12th St.—one swedging machine for beading purposes.

Wis., Milwaukee—The Milwaukee Forge & Machine Co., 340 Oklahoma Ave., V. F. Braun, Purch. Agt.—trimming press.

Wis., Milwaukee—The Quality Dairy Co., 2347 Hadley St.—special dairy plant equipment.

Wis., Milwaukee—M. Thiel, 680 Russell Ave.—Universal woodworker equipped with motor.

Wis., Sparta—F. J. Domke—drill press, air compressor, jacks, gas storage tank and pump.

Wis., Spooner—The Spooner Milling Co., J. W. Sleight, Purch. Agt.—flour and feed grinding machinery, motor power.

Ont., Allenford—J. Temple—equipment for garage and auto repair shop.

Ont., Guelph—The Gilson Mfg., Ltd., R. Dawson, Purch. Agt.—punch press with capacity of from 45 to 50 ton pressure with approximately a 5 in. stroke.

Ont., London—G. Little of Robinson Little Co., 343 Richmond St.—artificial ice making equipment.

Ont., Montreal—G. Thompson, 2280 St. Hubert St.—small lathe and about $500 worth of tools and equipment for garage and repair shop.

Ont., Parry Sound—C. W. Thompson & Son—equipment for garage and auto repair shop.

Ont., Walkerville—R. H. Cunningham & Co. of Walkerville, has secured a building at 351 Glebe St., London, and will install equipment for the manufacture of electrical furnaces.

Ont., West Lorne—The Seaman Kent Co.—special woodworking machinery for the manufacture of oak and hardwood flooring.

Ont., West Toronto—A. R. Williams Machine Co., 64 Front St.—air compressors and general shop machinery.

Ont., Wiarton—The Kastner Lumber Co.—equipment for saw mills.

Metal Working Shops

Cal., Oakland—S. S. Herrick, foot of Adeline St., has awarded the contract for the construction of a 1 story machine shop on 18th and Campbell Sts. Estimated cost, $5,000.

Cal., Stockton—Cohen & Coiren, 45 South Eldorado St., will build an auto repair shop on North Sutter St. Estimated cost, $6,000.

Conn., East Hartford—(Hartford P. O.)—T. Shannon, Russell St., South Manchester, has awarded the contract for the construction of a 1 story, 80 x 100 ft. garage and service station on Connecticut Blvd. here. Estimated cost, $40,000. Noted March 9.

Conn., Georgetown—Gilbert & Bennett Mfg. Co. has awarded the contract for the construction of a 3 story, 52 x 150 ft. addition to its wire goods factory. Estimated cost, $75,000.

Ia., Des Moines—J. A. Klemm Mfg. Co., 1322 Grand Ave., manufacturers of auto supplies, will soon award the contract for the construction of a 1 story, 66 x 84 ft. factory and garage on Grand Ave. Estimated cost, $10,000. F. A. Harris, 3815 4th St., Archt.

Ill., Chicago—The Dwyer Equipment Co., 9 West Kinzie St., has awarded the contract for the construction of a 1 story, 60 x 125 ft. factory at 4534 North Ave. for the manufacture of ventilating fans. Estimated cost, $15,000.

Ill., Chicago—The Hudson Motor Car Co., 25th St. and Michigan Blvd., has awarded the contract for the construction of a 3 story, 100 x 300 ft. office, sales and service station on 22nd St. and Michigan Blvd. Estimated cost, $350,000. Noted March 2.

Ill., Chicago—R. Johnstone, c/o O. Van Gunten, Archt., 800 North Clark St., has awarded the contract for the construction of a 2 story, 42 x 82 ft. auto repair shop on Clark and Howard Sts. Estimated cost, $20,000.

Ill., Chicago—A. Mikele, 1311 Washburn Ave., has awarded the contract for the construction of a 2 story, 72 x 107 ft. garage on Taylor and Garibaldi Aves. Estimated cost, $50,000. Noted March 2.

Ill., Dixon—E. R. Watts is having plans prepared for the construction of a 1 story, 54 x 150 ft. garage. Estimated cost, $40,000. Private plans.

Ill., Glen Ellyn—O. Smiller, 520 Crescent Blvd., is having plans prepared for the construction of a 2 story, 60 x 150 ft. garage on Crescent St. Estimated cost, $40,000. Private plans.

Ill., Harrisburg—O. O. Cummins Garage & Repair Shop is having plans prepared for the construction of a 1 story, 80 x 160 ft. garage. Estimated cost, $40,000. Private plans.

Mass., Worcester—The Amer. Steel & Wire Co., Grove St., has had plans prepared for the construction of a 1 story, 60 x 100 ft. galvanizing plant. C. E. Goodrich, c/o owner, Engr.

Mo., Jefferson City—The Automatic Water Pump Mfg. Co., 236 East High St., is having plans prepared for the construction of six or seven 1 story factory buildings. Estimated cost, $100,000. B. F. Schuetz, Pres. Private plans.

Mo., St. Louis—The Famous Barr Dry Goods Co., 6th and Olive Sts., plans to build a 6 story garage on 7th and Elm Sts. Estimated cost, $400,000. W. Levy, 625 Locust St., Archt.

Mo., St. Louis—The Johnson Automobile Co., 3667 Olive St., is having plans prepared for the construction of a 2 story, 50 x 52 ft. garage at 3667 Olive St. Estimated cost, $45,000. W. L. Johnson, Pres. W. P. McMahon, Title Guaranty Bldg., Archt.

Mo., St. Louis—The Levering Investment Co., Pierce Bldg., is having plans prepared for the construction of a 3 story, 100 x 150 ft. office, warehouse and shop on 12th and Gratiot Sts. Estimated cost, $150,000. J. R. Whittshore, Pres. P. J. Bradshaw, International Life Bldg., Archt.

Mo., St. Louis—The United Ry., c/o R. Wells, receiver, 39th and Park Sts., has awarded the contract for the construction of a 2 story, 50 x 72 ft. and 1 story, 80 x 208 ft. office, repair shop and warehouse, on Taylor St. and Bway. Estimated cost, $100,000. Noted Oct. 13.

N. J., Camden—Lackey & Hettle, Archts., 5 Hudson St., will soon receive bids for the construction of a 1 story, 150 x 160 x 175 ft. sales and service station on Federal and Newton Sts. for the Studebaker Sales Co., c/o architects. Estimated cost, $65,000.

N. Y., Binghamton—E. T. Gaige, 235 Vestal Ave., has awarded the contract for the construction of a machine shop, repair and storage building on State St. Estimated cost, $40,000.

N. Y., Binghamton—M. and H. Horrowitz have purchased a site on Hawley and Collier Sts., and plan to build a 1 story, 47x75 ft. machine shop and car storage plant. Estimated cost, between $12,000 and $15,000.

N. Y., Waverly—R. Perry plans to build a 2 story machine repair and car storage plant on Elizabeth St. Estimated cost, between $15,000 and $18,000.

O., Cleveland—C. W. Fessenden, 2371 East 4th St., has awarded the contract for the construction of a 1 story, 50 x 141 ft. garage at 2892 East 116th St. Estimated cost, $50,000. Noted March 9.

O., Cleveland—McKinney Steel Co., 802 Perry Payne Bldg., has awarded the contract for the construction of a 1 story sintering plant on Dille Rd. Estimated cost, $75,000.

O., Cleveland—The Parker Electric Co., 1839 Euclid Ave., has awarded the contract for the construction of a 2 story 41x80 ft. office and factory at 4502 Prospect Ave. Estimated cost, $40,000.

Pa., Butler—The Butler Buick Co., Main St., will soon award the contract for the construction of a 3 story, 33 x 110 ft. garage and sales station on Main St. Estimated cost, $150,000. Hunting Davis Co., Century Bldg., Pittsburgh, Archts. Noted Feb. 23.

Pa., Phila.—J. J. Gilman, 1126 Girard Ave., is having plans prepared for the construction of a 2 story 25x178 ft. garage at 2524 North Broad St. Estimated cost, $190,000. J. S. Landes, 200 West Broad St., Soudertown, Pa., Archt.

Pa., Phila.—L. T. Olb, c/o H. T. Saunders, 38 South 16th St., will build a 1 story, 124x151x260 ft. garage on Watts St. and Ridge Ave. Estimated cost, $75,000.

Wis., Cudahy—J. Paulu, Archt., St. Francis, (Milwaukee P. O.), is receiving bids for the construction of a 1 story, 60x120 ft. garage on Packard Ave., for L. Odry, 1211 Packard Ave. Estimated cost, $40,000.

Wis., Madison—G. Nelson, 117 West Johnson St., is receiving bids for the construction of a 1 story, 110x152 ft. garage on Johnson St. Estimated cost, $40,000. A. E. Small, Ellsworth Bldg., Archt.

Wis., Merrill—The Merrill Buick Co. will soon award the contract for the construction of a 1 story, 50x122 ft. garage on Main St. Estimated cost, $40,000. Private plans. Noted March 7.

Ont., Leaside—The Durant Motors of Canada, 1011 Royal Bank Bldg., Toronto, plans to build a 3 story, 80x600 ft. auto factory here. Estimated cost, $400,000. Private plans.

Ont., Parry Sound—C. W. Thompson & Son plan to build garage and auto repair shop to replace the one destroyed by fire. Estimated cost, $28,000.

General Manufacturing

Cal., Benicia—G. W. Hume Co., 311 California St., San Francisco, plans to construct additional cannery buildings to its plant, here.

Cal., Colusan—The California Prune & Apricot Growers Assn., San Antonio St., San Jose, plans to build a 1½ story packing plant on Cooper's 2nd Extension here. Estimated cost, $125,000. Private plans.

Cal., Fresno—The Fresno Macaroni Mfg. Co., 480 1st St., has awarded the contract for the construction of a 1 story macaroni factory on Block 27. Estimated cost, $12,900.

Cal., Sacramento—The California Candy Co., c/o A. W. Norris, contractor, Peoples Bank Bldg., has awarded the contract for the construction of a 3 story, 40 x 160 ft. candy factory on R St. Estimated cost, $60,000.

Conn., Hartford—Buck & Sheldon, Inc., Archts. and Engrs., 60 Prospect St., will soon award the contract for the construction of a 4 story, 80 x 100 ft. and 80 x 400 ft. brush factory on Windsor Ave. for the Fuller Brush Co., Asylum St. Estimated cost, $400,000. Noted Sept. 8.

Conn., New Haven—The Natl. Filter & Cloth Weaving Co., 57 Hope St., Brooklyn, N. Y., is having plans prepared for the construction of a 1 story factory on Dixwell Ave. and Mather St., here. Estimated cost, $50,000. W. O. Tate, Bronxville, N. Y., Archt. and Engr.

Fla., Milldale (Jacksonville P. O.)—The Putnam Lumber Co. plans to build saw mill to replace the one destroyed by fire. Estimated loss, $140,000.

Ill., Chicago—Rechsteiner Embroidery Co., 4743 Bernard Ave., has awarded the contract for the construction of a 2 story, 125 x 125 ft. factory on Argyle and Crawford Sts. Estimated cost, $65,000.

Ill., East St. Louis—The Cain Hurley Lumber Co., 1406 Chemical Bldg., St. Louis, Mo., is having plans prepared for the construction of a 1 and 2 story lumber plant to replace the one destroyed by fire. Estimated cost, $45,000. E. M. Cain, Pres. Private plans.

Ill., East St. Louis—The Highland Ice Cream Co., plans to build a 1 story, 26 x 80-57 x 58-45 x 105 ft. ice cream factory on St. Clair and 20th Sts. Estimated cost, $75,000. Private plans.

Ill., Mattoon—The Mattoon Creamery Co. has awarded the contract for the construction of a 1 story, 50 x 130 ft. dairy and creamery. Estimated cost, $25,000. P. Bertram, Mgr.

Ill., Pinckneyville—The Atlas Powder Co. plans to build a 1 and 2 story powder plant. Estimated cost, $200,000. W. A. Smith, Pinckneyville, Engr.

Mass., East Douglas—The Hayward Woolen Co., North Main St., has awarded the contract for the construction of a 2 story, 48 x 126 ft. and 68 x 150 ft. dye house and picker building. Estimated cost, $100,000.

Mass., Marlboro—The Dennison Mfg. Co., Farmingham, has awarded the contract for the construction of a 4 story, 70 x 300 ft. factory for the manufacture of paper products. Estimated cost, $400,000.

Mich., Detroit—The Eastern Market Sausage Co., 2472 Riopelle St., is having plans prepared for the construction of a 2 story, 26 x 48 x 105 ft. manufacturing plant on Winder St. Estimated cost, $38,000. Hazleton, Clark & Co., 1359 Book Bldg., Archts.

Mich., Detroit—The Mills Baking Co., 5165 4th St., will soon award the contract for the construction of a 3 story, 70 x 140 ft. bakery plant on Merrick Ave. Estimated cost, $40,000. Smith, Hinchman & Grylls, 710 Washington Arcade, Archts. Noted March 2.

Minn., Minneapolis—The Fulton Bag & Cotton Mills, 643 Security Bldg., V. C. Douglas, representative, is having plans prepared for the construction of a 3 story factory and administration building on East Hennepin Ave. and Taft St. Estimated cost, $300,000. Kees & Colburn, 245 Plymouth Bldg., Archts.

Minn., Minneapolis — The Norwegian Lutheran Deaconess Hospital, 2312 15th Ave., S., is having plans prepared for the construction of a 2 story, 45 x 75 ft. power house, laundry and dormitory, on 15th Ave., S. and 24th St. Estimated cost, $45,000. F. Paulson, Supt. Magney & Tusler, 126 South 9th St., Archts.

Minn., St. Paul—The Roe-James Glass Co., 109 East 9th St., has purchased a site on 8th St. near Minnesota St. and plans to build a 4 story, 50 x 190 ft. factory and office. Estimated cost, $150,000. Will probably be built in 1923. Architect not announced.

Mo., Hannibal—The Robinson Bros. Paint Co., 201 South 5th St., has awarded the contract for the construction of a 1 story factory and warehouse. Estimated cost, $40,000. Noted Feb. 23.

Mo., Jefferson City—Ruwart Bros. Mfg. Co., 100 Monroe St., plans to build a 1 and 2 story addition to its saddling factory. Estimated cost, $25,000. Architect not selected.

Mo., Marshall — W. C. Fisher and T. Thorp plan to build a 1 story dairy and ice cream factory. Estimated cost, $25,000. Architect not selected.

Mo., St. Louis—The American Syrup & Preserving Co., Ruskin Ave., is having plans prepared for the construction of a 2 story, 60 x 225 ft. factory and warehouse at 5111 Penrose Ave. Estimated cost, $26,000. E. J. Lawler, 404 Sawyer Bldg., Archt.

Mo., St. Louis—M. Bass & Sons, 5175 Easton Ave., are having plans prepared for the construction of a 1 story, 50 x 125 ft. laundry at 5100 Easton Ave. Estimated cost, $35,000. Private plans.

Mo., Pierce City—The Juvenile Shoe Corp., Carthage, plans to build a shoe factory on Main St. here. Estimated cost, $10,000.

N. J., Blackwood—The Cambria Hosiery Mills, A and Cambria Sts., Phila., will soon receive bids for the construction of a 1 story 45 x 200 ft. hosiery mill here. Estimated cost, $35,000. M. W. Easby, 1804 Chestnut St., Phila., Engr.

N. J., Gloucester—The Gloucester Sanitary Milk Co. is having plans prepared for the construction of a 2 story, 40 x 50 ft. bottling plant. Estimated cost, $25,000. Lackey & Hettle, 5 Hudson St., Camden, Archts.

N. J., Montclair—The Montclair Rink & Ice Co., c/o G. Backhoff, Archt. and Engr., 9 Clinton St., Newark, is having sketches made for the construction of a 1 story, 125 x 250 ft. ice plant and skating rink. Estimated cost, $200,000.

N. Y., Buffalo—The Westinghouse Electric & Mfg. Co., Ellicott Sq., plans to build a 1 story, 125 x 128 ft. factory and warehouse on Milton St. Estimated cost, $17,000.

N. Y., Gasport—The Wickwire Limestone Co. plans to build agricultural lime plant to replace the one which was recently destroyed by fire. Estimated loss, $50,000.

N. Y., Little Falls—The Barnet Leather Co., Inc., 598 East Mill St., plans to build a 3 story addition to its leather manufacturing plant. Estimated cost, $200,000. Address E. L. White, Genl. Mgr.

N. Y., Long Island City—The Ronzonni Macaroni Co., 612 Jackson Ave., plans to build a 5 story addition to its factory on Jackson Ave. Architect not selected.

N. Y., New York—The Gotham Silk Hosiery Co., 516 5th Ave., plans to build a factory on 33rd St. and 1st Ave. Estimated cost, $250,000.

O., Akron—The Brown Graves Co., 65 East Miller Ave., manufacturers of sash doors and interior finishing, plans to build a three story factory on Miller Ave. to replace the one destroyed by fire. Estimated cost, $200,000.

O., Cleveland—The Natl. Carpet Cleaning & Rug Mfg. Co., 1971 West 50th St., has awarded the contract for the construction of a 2 story, 40 x 123 ft. factory on West 50th St. and Lorain Ave. Estimated cost, $50,000. Noted July 7.

O., Cleveland—The Pearl State Road Market Co., c/o C. Kamp, Pres., Euclid and 46th Sts., is having plans prepared for the construction of a 2 story, 200 x 200 ft. market and commercial building, including a refrigeration plant, on Pearl and State Rds. Estimated cost, $250,000. A. E. Keller, 1298 Carlyon Rd., Archt.

O., Cleveland—The Saginaw Bay Lumber Co., c/o C. H. Prescott, 2106 West 3rd St., has purchased a site on Harvard Ave. and East 42d St., and plans to build a 1 and 2 story lumber yard, consisting of six buildings, mill sheds, office and garage. Estimated cost, $150,000. Private plans.

O. Youngstown—The Ward Baking Co., Southern Blvd. and St. Marys St., New York City, is having plans prepared for the construction of a 4 story, 71 x 168 ft. bakery on Manoning Ave., here. Estimated cost, $150,000. C. B. Comstock, 110 West 40th St., New York City, Archt. and Engr.

Pa., New Cumberland—The New Cumberland Box Co., Bridge and 2nd Sts., is having plans prepared for the construction of a 2 story, 60 x 90 ft. factory on Bridge St. Estimated cost, $50,000.

Pa., Phila.—The Bisler Box Co., 245 North 6th St., is having plans prepared for the construction of a 6 story, 112 x 190 ft. box factory on 10th and Spring Garden Sts. Estimated cost, $250,000. Private plans.

Pa., Phila.—The Cambria Silk Hosiery Co., A and Cambria Sts., has awarded the contract for the construction of a 2 story, 53 x 53 x 119 x 184 ft. hosiery mill on Louden and Mascher Sts.

Pa., Phila.—The Curtis Publishing Co., Independence Sq., has awarded the contract for the construction of a 3 story, 145 x 215 ft printing plant (1st unit), on 7th and Sansom Sts. Noted Feb. 2.

Wis., Eau Claire—E. Peterman, 312 Gibson St., has had plans prepared for the construction of a 1 story, 50 x 105 ft. dry cleaning plant on Chippewa Rd. Estimated cost, $50,000. Private plans.

Wis., Sheboygan—The Sheboygan Gas Co., 618 North 8th St., has awarded the contract for the construction of a 1 story, 42 x 146 ft. gas plant on 8th St. Estimated cost $50,000. Noted March 2.

Wis., Wausau—The Levenhagen Dairy Co., 613 3rd St., has awarded the contract for the construction of a 2 story, 75 x 95 ft. dairy on Washington St. Estimated cost, $45,000.

Wis., Mayville — The Peerless Traveling Goods Co. plans to build a 2 and 3 story, 50 x 90 ft. factory on Main St. for the manufacture of leather goods. Estimated cost, $50,000. Architect not selected.

Ont., Deer Lake—Tudhope & Ludgate, Parry Sound, plans to build a saw mill here. Estimated cost, $25,000.

Que., Hull—The Canadian Automobile Corp., 199 Sparks St., Ottawa, plans to build a rubber tire factory on Lamontagne Park, here. Estimated cost, $50,000. C. A. Fox, 394 Harvard St., Montreal, Archt.

Ont., Toronto — Barber Ellis, Ltd., 71 Wellington St., W., has awarded the contract for the construction of a 3 story, stationery plant on Adelaide St., W. Estimated cost, $150,000.

Ont., Welland—The Empire Cotton Co. plans to build an addition to its factory. Estimated cost, $250,000. Architect not selected.

Que, Wrightville—The Easton Chemical Co., Ltd., 197 Sparks St., Ottawa, Ont., plans to build a factory here. Estimated cost, $10,000. Architect not selected.

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American Machinist

KENNETH H. CONDIT and FRED H. COLVIN, *Editors*
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Machine Operations in a California Pump Shop—Special Correspondence
Tool Engineering—Albert A. Dowd and Frank W. Curtis
The articles listed above are to appear in the next issue.

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Philadelphia, October 26 1921

ADDRESS ALL COMMUNICATIONS TO THE COMPANY

Mr. Mason Britton, General Manager,

American Machinist,

New York City.

My dear Mr. Britton,

I congratulate the "Machinist" upon its coming 44th Anniversary.

A great deal comes and goes both as to men and things in such a long period. In retrospect I recall many changes in the life of the "American Machinist"; but one thing stands out very prominently and that is its constant progress - its make up and matter and the general service which it has always given, not only to its advertisers, but also to those industries and interests and individuals to whom its advertisers made their appeal. And notwithstanding the enviable position it has already achieved I cannot see that it is halting to attain still higher levels which will in turn redound to the advantage of those it seeks to serve.

Again I congratulate the "Machinist" and all connected with it upon its youthful vigor in its advancing age.

Yours very truly,

Jus. H. Schwacke

JHS*G

MANAGER

American Machinist

Volume 56 NEW YORK, APRIL 13, 1922 Number 15

Keeping Track of Sales and Distributors

Cards and Forms for Recording Sales and Shipping Data in Shop and Office—Records to Show Activities of Agents

By A. H. TUECHTER
President, the Cincinnati-Bickford Tool Co.

IN THESE days when sales are harder to make than they have been for years, an efficient system of sales records is a big help. This is particularly true of a company like ours where most of the sales are made through dealers. By this I don't mean that such records

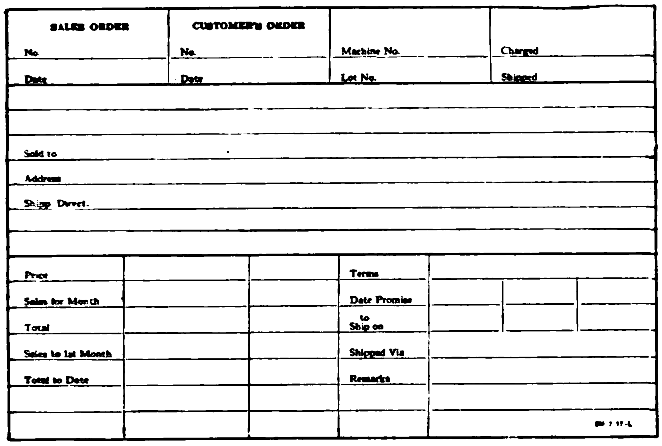


FIG. 1. SALES ORDER RECORD CARD

are not equally valuable to the manufacturer who sells direct, but rather that the builder who distributes his product through dealers must have adequate means of knowing exactly what each dealer is producing in the way of sales in the various territories which he may happen to represent.

Our system of sales and distribution records is not perfect, and probably would not be applicable exactly as it stands to any other company; but there are ideas and methods connected with it that may prove of some benefit to others. Some of the incongruous elements that will appear later are due to the fact that certain forms and methods have been retained from each of the two companies which were united in 1909 to form the Cincinnati-Bickford Tool Co. The differences in the two systems, in such cases, were too small to warrant the time and expense necessary to change them, and they have consequently been allowed to run along ever since the beginnings of the present company.

Upon receipt of an order, the 4 x 6-in. card form, shown in Fig. 1, is filled out. If the order is for a radial drilling machine a white card is used. Upright drilling machine orders are entered on blue cards and orders for repair parts on salmon-colored cards. Our sales order number is put in the upper left-hand box prefixed by "R" for radial or "U" for upright as the circumstances demand. The dealer's order number goes in the next box. Dates of each are, of course, put in the indicated places.

In the third box are the machine and lot numbers. We use letters to indicate the various sizes of uprights and numbers and letters for the radials, 4A indicating a 4-ft. universal machine, and 4D, a 4-ft. plain, for instance. The requisite dates are inserted in the right-hand box at the proper times.

Just below the boxes a description of the machine is entered. After "Sold to" comes the name of the dealer who placed the order and then his address. Shipping directions show the final purchaser's name and address to which the machine is to be shipped. His order number is also put down if it is known.

Opposite "Price," we put the list price, the discount and the net price to the dealer. Under the net price to the dealer goes the amount of sales in the current month. Addition gives the total sales for the month including the present sale. Below this total again is the amount of the sales for the current year up to the first of the

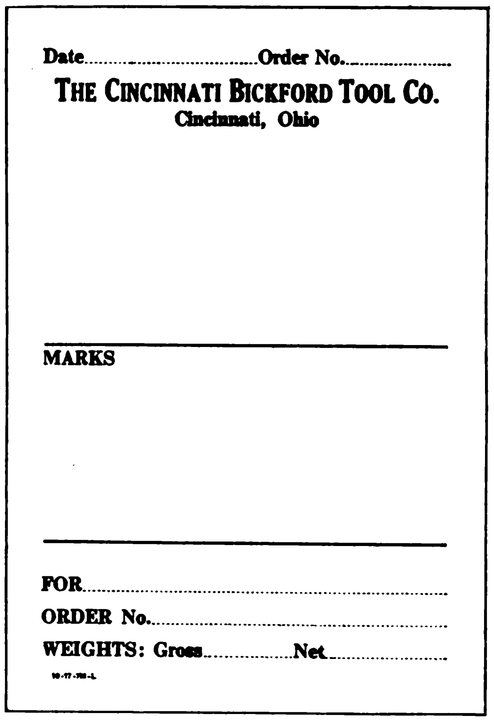


FIG. 2. SHOP TICKET

current month, and below that the total including the present sale.

The entry opposite "Terms" depends on the contract with the dealer or customer. In the main the terms are uniform, but it might be necessary to have some differ-

ence, as for example between domestic and foreign connections.

The following six rectangles for dates are to indicate the time when shipment is promised or to note the date when shipment is requested by the customer. The other two items are self-explanatory.

On the back of the card, which is unruled, we place in the upper left-hand corner the amount in dollars of the total unfilled orders on our books. From that figure we deduct any shipments or cancellations that may occur before the face of the card is filled out. When an order is received and the face of the card is filled out, the amount of the order is added to the net total on the back and we then have the new amount of unfilled orders. This amount we transfer to the back of the next unfilled card which becomes the live-card in the front of the file waiting for the next order.

As soon as shipment is made the card we have filled out completely is shifted to the back of the file, where it remains until the end of the month. Then the records are transcribed to the proper places and the card goes to the permanent file under its order number.

From the form of Fig. 1 the shop ticket shown in Fig. 2 is made out. This form is yellow for regular upright drilling machines, and is made out in triplicate, one copy going to the shop foreman, one to the cost department and the third to the shipping department. The order number is the same as the sales order number. In the upper space is a description of the machine. The lower space has the name and address of the customer and the serial number of the machine.

After "For" appears the dealer's name and below it his order number. Weights are put on in the shop.

A similar form on blue paper is made out in quadruplicate for special upright drilling machines and for accessories and attachments. The fourth copy goes to the routing department so that the special features can be controlled.

For radials and repair parts a salmon-colored form is used. This, too, is made out in quadruplicate.

The lot record of Fig. 3 is a 9½ x 12-in. form used both for temporary and permanent record. When it is decided to put a new lot of machines through the shop a pencil record is made out on this form. The lot number is put at the head of "Lot No." column and below it are entered as they come in, the sales orders under which the various machines are shipped. The machine numbers are all put down in column five and assigned to the various order numbers as the circumstances direct.

Column two is filled out by judgment based on the trend of sales as shown in the record. For instance, in a given lot of uprights, six might be built with tapping attachments, the balance without. In the next column any special requirements of the customer are entered from the sales order.

In columns six and seven are put the name and address of the dealer placing the order, except in the case of a direct sale. Shipping marks and destination are taken from Fig. 1 and the date shipped is put in when the machine leaves the factory. When the whole lot has been shipped the lot record as it finally stands is copied in ink for permanent record.

The forms described so far may be called primary records. From them various secondary records are made out to bring out more clearly certain data. For instance, the 4 x 6-in. card of Fig. 4 is made out with amounts of orders and shipments in dollars for each agency office. There is also a similar card showing the total business of the dealer in all his offices. The card shown in Fig. 5 gives the annual record of the dealer in dollars.

Annual dealer records in numbers of machines instead of in dollars are shown on the 5 x 8-in. cards of Figs. 6 and 7, Fig. 6 showing uprights and Fig. 7 showing radials.

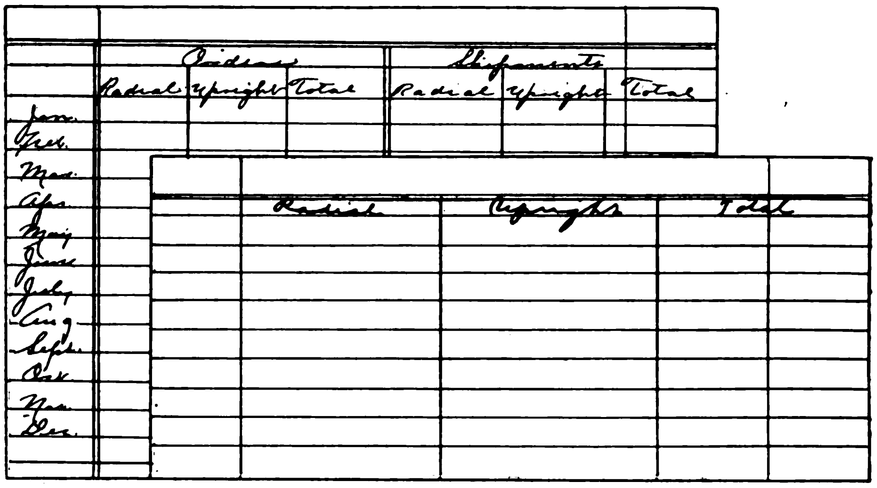


FIG. 4 (ABOVE). AGENCY RECORD IN DOLLARS BY MONTHS. FIG. 5 (BELOW). AGENCY RECORD IN DOLLARS BY YEARS

Another useful card file is made up from the primary

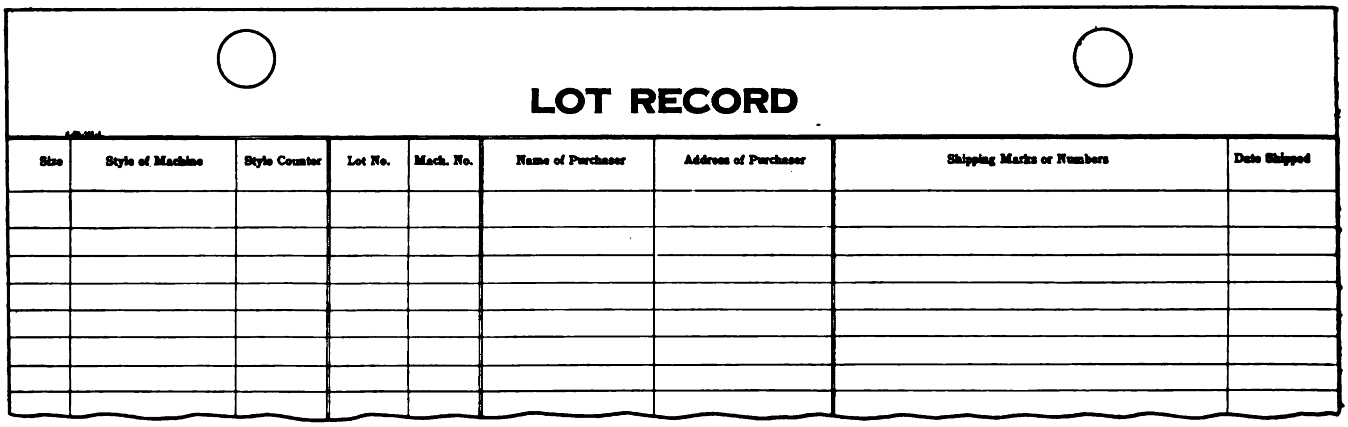


FIG. 3. LOT RECORD SHEET

	Regular										High Speed						Special
	20"	Sta 21'	Sli 21'	24"	24-36	28"	32"	36"	42"	Hor	24"	24-36	28"	32"	36"	42"	

	Regular						Univ			High Speed							Special
	2½'	3'	3½'	4'	5'	6'	4'	5'	6'	20P							

FIG. 6 (ABOVE). ANNUAL RECORD OF UPRIGHT DRILLING MACHINE SALES.

FIG. 7 (BELOW). ANNUAL RECORD OF RADIAL DRILLING MACHINE SALES

records on the tabbed 3 x 5-in. cards of the kind shown in Fig. 8. The cards are filled in at the end of each month and show the machines sold to a firm during the month. As will be seen from the illustration the

TOWN		STATE	
FIRM			
STYLE MACHINE	No.	BY WHOM SOLD	DATE
[illegible]			

FIG. 8. SALES RECORD FOR GEOGRAPHICAL FILING

cards are arranged to be filed geographically. They are useful in keeping a check on what the dealer is selling in any given district. They are also valuable in locating the machine number when a customer sends in for repair parts without giving the number in his correspondence.

Finally there is the agency record made out on a 12 x 19-in. sheet with the headings shown in Fig. 9. Two separate records are kept on this form, the first of which is a sort of day book in which a record of each machine sold by the agency is entered as the shipment is made. From this sheet it is easy to watch the volume of business turned in by each agency office.

A more interesting comparative record is obtained by rearranging the items on the big sheet so that the orders are grouped by cities. It is immediately evident from this record whether an agent is making good in one city or falling down in another, for his sales over a period of years are all there so that they may easily be compared. If more tools are being sold in a small city than in a big one there must be some reason, or if $100,000 worth of machines were sold in this city in 1920 and only $5,000 worth in 1921, it may be worth while to find out why.

On the whole we find these records invaluable in our business. In case of dispute over territory or results, with any agent or between two agents, we have the records at hand and can show the facts in the case at a few minutes' notice.

AGENCY RECORD

NAME LOCATION YEAR

MONTH	CUSTOMER	ADDRESS	Quantity	DESCRIPTION	UPRIGHTS	RADIALS	SPECIALS	TOTALS

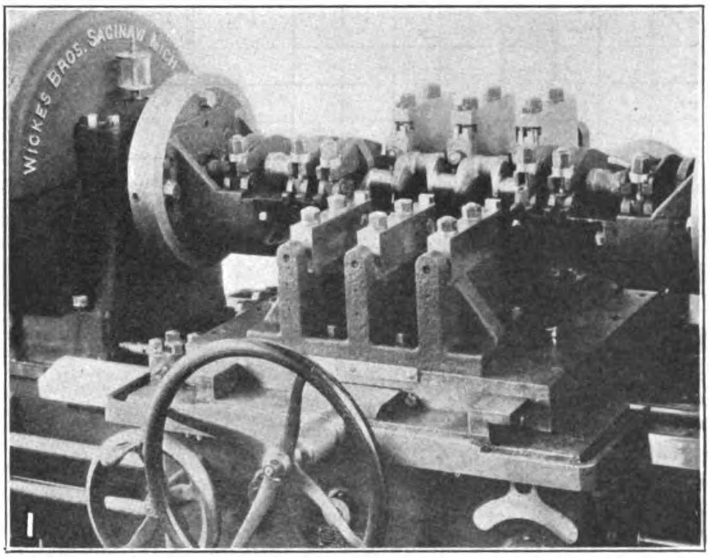
FIG. 9. AGENCY SALES RECORD SHEET

Machining the Franklin Crankshaft

Machines and Methods Used in Turning the Center Bearings and Crankpins on a Seven-Bearing Crankshaft—Drilling for Lubrication—Balancing

By FRED H. COLVIN
Editor, AMERICAN MACHINIST

AS THE Franklin motor uses a seven-bearing crankshaft, it presents somewhat more of a machining problem than some other designs of shafts. After the forging, heat-treating and straightening operations, the crankshafts are turned on Wickes lathes as seen in Figs. 1, 2 and 3. The first illustration shows the turning of the three central bearings, the shaft being driven from both ends and the three bearings turned at once, together with the facing of the cheeks on the sides. This can, perhaps, be better understood by referring to Fig. 2 which shows the lathe with the crankshaft removed and gives a good idea of the driving heads A and B, and their clamps for holding the shafts in position. The turning tools are held in the substantial holders shown at C, while the side or web facing tools are shown at D. The web facing cutters are set at a suitable angle to make adjustments for width on easy matter. The lathe is provided with a spacing bar E, which allows the carriage to be easily located for different bearings on the shaft. In Fig. 3 are shown the second and fifth crankpins being turned in a similar lathe, and also the holding fixture used, in considerable detail, as well as the diameter stop at A. Drilling the oil holes, which form such an important part of a forced feed lubrication system, is accomplished in the battery of three machines, shown in Fig. 4. These machines have special drilling heads, and fixtures which hold the crankshaft at the desired angle and in the proper position for



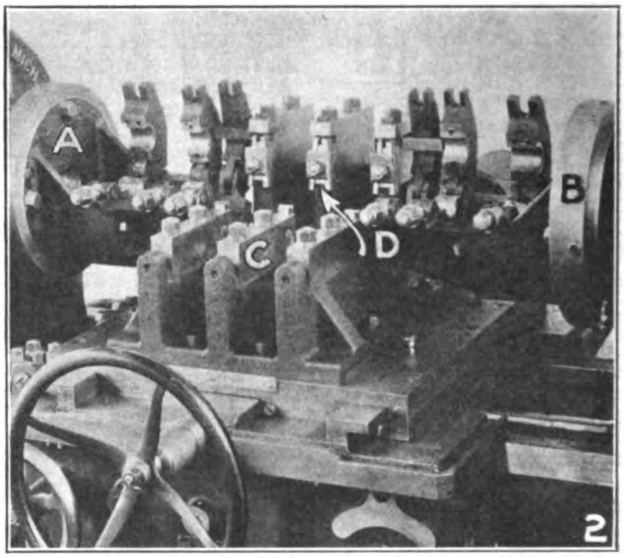


FIG. 1. TURNING THE THREE CENTER BEARINGS. FIG. 2. LATHE EMPTIED TO SHOW TOOLS

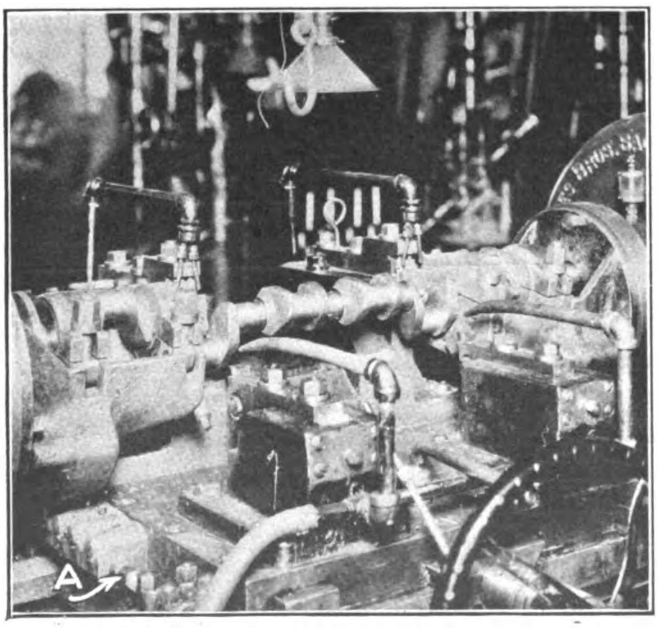


FIG. 3. TURNING THE CRANKPIN

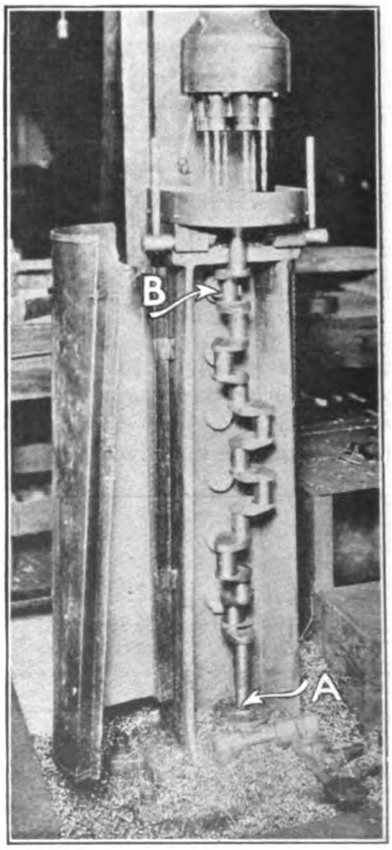


FIG. 5. DRILLING THE END FLANGE

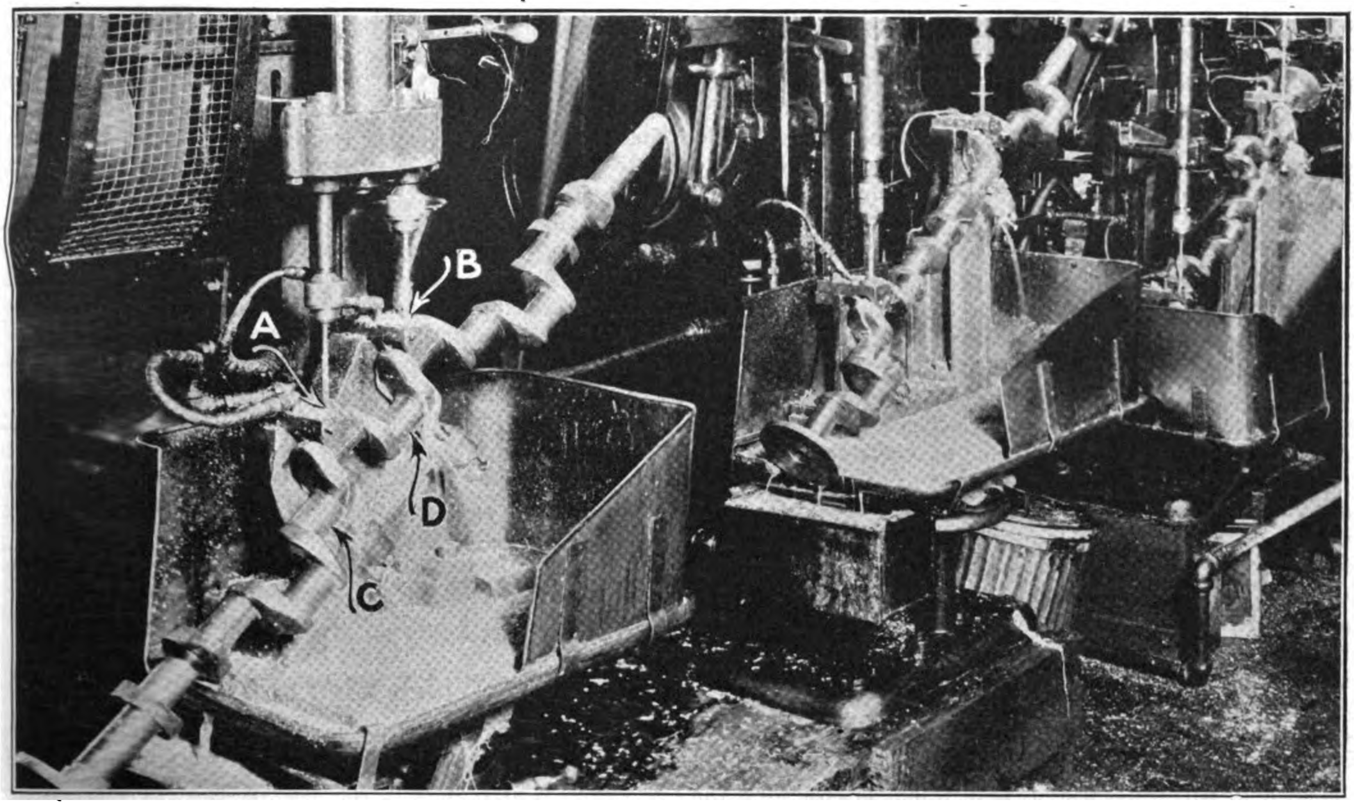


FIG. 4. DRILLING THE OIL DUCTS IN THE BEARINGS

the different holes. Referring to the machine at the left, the different lengths of drilling spindles can be seen, although both are driven from a single head. The guiding bushings *A* and *B* start the drills through the third and fourth crankpins and guide them through the crankpins, through the webs and out through the main bearings of *C* and *D*. As the oil pump forces lubricant through every main bearing, these holes must guide the oil direct to the adjoining crankpin to insure positive lubrication at all times.

In a similar way the second machine drills the holes in the second and fifth crank pins, and through the web to the adjoining bearings. In the last operation (on the third machine) the crankshaft has been reversed so that the holes are drilled in the opposite direction to that in crankpins one and six. Thus six crankpins and six of the seven main bearings are drilled. The end bearing receives oil direct from the pump, but does not feed any other bearings. This method of drilling the crankshaft is very simple and satisfactory and has facilitated production.

Drilling the flange at the end of the crankshaft is

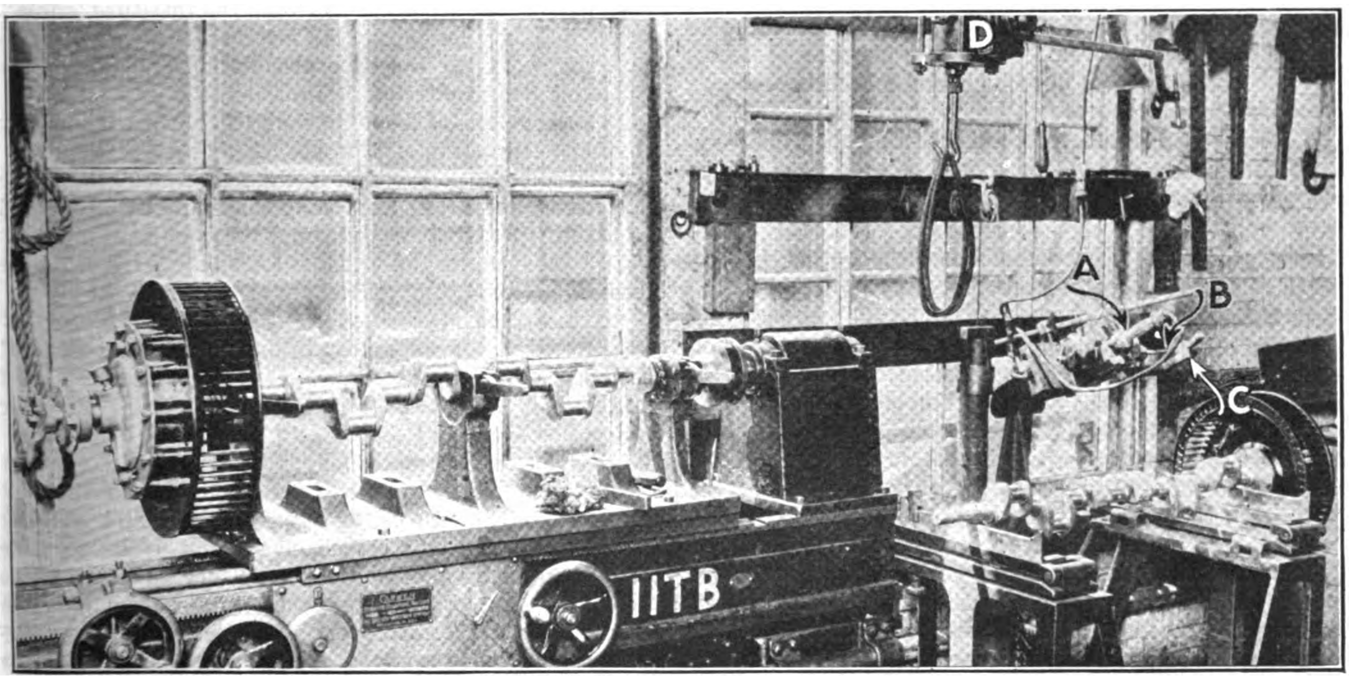


FIG. 6. STATIC AND DYNAMIC BALANCING OF COMPLETE CRANKSHAFT

accomplished with the simple fixture shown in Fig. 5, which consists of a special drilling head having six spindles and a box form of fixture with an enclosing cover. The lower end of the crankshaft rests on a center at *A*, while the upper end is positioned by a suitable centering device, as well as the steadying fork *B*. The six holes in the flange are drilled in one operation.

Balancing the Complete Crankshaft

After the crankshaft has been finish-ground, the Sirocco fan, which is one of the main features of the Franklin cooling system, is mounted on it, together with the couplings which go back to the first universal joint. The whole unit is then given both a standing and a running balance, as shown in Fig. 6. The standing balance is given on the stationary balancing ways shown at the right, these ways being adjustable in both directions so as to make it easily possible to keep them level and lined up at all times. Conveniently mounted over the balancing ways, is the portable electric drill, shown at *A*, by which excess metal can readily be drilled out from any point, should this be found necessary in the static balance. The drill itself can be seen at *B*, and the supporting arm, or "old man" at *C*.

Then the whole unit is carefully lifted by means of the hoist at *D*, and swung over into the Carwen dynamic balancing machine shown at the left. Here the running balance is carefully tested, and when satisfactory the crankshaft is ready to be assembled with the other motor parts. It will be noted that the balancing is done with the universal spider, grease cup, and other small parts in place, so as to insure satisfactory service in the completed motor.

Amortization of Plant Facilities

By Page Golsan
Ford, Bacon & Davis, Inc.

I have just read with a great deal of interest Mr. Figsby's article, "Amortization of Plant Facilities," on page 482 of American Machinist. Mr. Figsby has very clearly expressed the situation. However, I wish to call your attention to the subhead of his article reading as follows:

> "Regulations 62 of the Treasury Department Give Manufacturers Another Chance to File Claim—Substantial Relief Available Under Little-Understood Provision."

I am of the opinion that this subheading was placed over his article by your proofreader, because it is not in accordance with the facts which the author has set forth. The Treasury Department has no authority to give manufacturers any "chances" to file claims. The permission to file a claim and the dates of limitations therefor are specifically set forth in the Revenue Act quoted at length in the article. The law states that the claim shall be allowed "if claim therefor was made at the time of filing return for the taxable year 1918, 1919, 1920, or 1921." The Treasury Department has permitted the filing of 1921 returns in tentative form on March 15, 1922, subject to final revision by June 15, 1922. A literal interpretation of the law, therefore, makes it mandatory that some sort of amortization claim shall have been filed at least by March 15, 1922, and if this has not been done I cannot see how another "chance" is available.

The law specifically states that revisions of these claims may be made at any time "before March 3, 1924." This is clearly set out by Mr. Figsby in his last paragraph. However, the manufacturer is in a position to revise only if "he has come under the wire" by having filed some form of claim in accordance with the law's dates of limitation. I take this occasion to write you along these lines that your heading be not misleading.

You further state that the question of amortization is little understood. I must differ with you on this account for in our work along these lines we have found a very high understanding of the subject by the officers of companies entitled to these considerations. In general, the only question has been as to the method of determining value-in-use. This value, as Mr. Figsby outlines, is a definite engineering problem and subject to solution only from that viewpoint. You would not call in an accountant to tell you how much a power plant was worth. That is an engineer's business. On the other hand, the setting up of tax returns and the determination of the capital amounts to be amortized are the accountant's business. In preparaing the final claim for amortization both have their particular field.

Which Kind of Ton?

The American Institute of Weights and Measures has issued the following letter addressed to its members and friends:

"In the English system of weights and measures the 'ton' has two values: The 'Long ton' of 2,240 lb. and the 'Short' ton of 2,000 pounds.

"The critics of the English system make the most of this element of uncertainty as to tons. We have found, also, that there is a rather prevalent feeling among manufacturers and others that this duality of 'tons' is fairly open to criticism as objectionable.

"However, it is apparent that the real basis of the objection is not so much that we have two kinds of tons, as that they have not been easily designated or distinguished in common usage.

"In order to meet this situation in as simple a manner as possible and to minimize misunderstandings in the use of these two values of the 'ton,' the institute, subject to the majority opinion of its members, desires to advocate and work for the general adoption and use of the following definitions and designations:

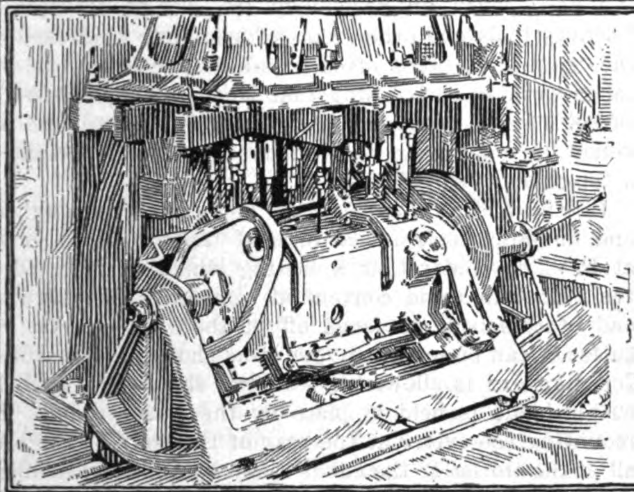
(1) A weight of 2,000 lb. shall be known without any further designation as a 'ton.'

If circumstances demand it, the ton of 2,000 lb. can be designated as 'S-ton,' this being especially recommended in trade with Great Britain and its colonies.

(2) A weight of 2,240 lb. shall ALWAYS be designated as 'L-ton' (Pronounced Ell-ton).

"If in sympathy with our aims, you or your company approve of this move, kindly return to us in the enclosed stamped envelope the lower part of this sheet signed and dated; if you do not approve kindly state your objections."

All men in the machinery industry should consider themselves as the friends of the American Institute of Weights and Measures, or at any rate should consider the institute as their friend on account of its valuable work in fighting against the compulsory adoption of the metric system. We suggest that this problem be given immediate consideration and that the approval or disapproval of those engaged in the machinery industry be sent to C. C. Stutz, secretary of the institute, 115 Broadway, New York.



Tool Engineering

By

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Attachments for Turret Lathes—Factors Influencing the Design—Duplex Attachment for Turret—Forming and Generating Tools for Taper Turning and Boring

TAPERED and curved surfaces, both external and internal, often require special attachments in order to machine them accurately. Inside forms when of small diameter are often machined by the use of tapered or formed reamers; large diameters by a flat tool of correct shape, or by means of a generating attachment so arranged as to cause a single-point tool to travel along the taper or the form of the contour. Outside contours may be produced by a formed tool on the turret or cross-slide, or by means of an attachment using a single-point tool so arranged that it will follow a specified form and reproduce this on the work. Attachments for producing angular and curved surfaces are applied in many kinds of manufacturing work to engine or turret lathes. They are often used in combination with other tools for turning, boring and facing; and they may be operated simultaneously or separately, according to the requirements of the work.

Tapered and curved surfaces do not always require a generating action to produce them within the required limits of accuracy. For small work, forming tools of various kinds or tapered reamers can often be used with success on certain kinds of materials, such as cast iron, brass and steel of low carbon content. Alloy steels containing nickel and chromium usually require a generating attachment with a single-point tool, because the "wirey" character of the material does not lend itself readily to formed cuts with wide-faced tools.

Conditions occasionally require more tools than the turret faces will permit; and in such cases it may be necessary to design a special attachment to be applied to the face of the turret, such that two or more tools can be used by indexing the attachment. This procedure is not necessary very often, but there are times when a special attachment can be used to advantage and thus avoid the necessity of an extra operation. Several important points in connection with the design of attachments are given in the following paragraphs.

1. The material to be cut determines to some extent whether a generating tool is required or whether simple forming tools can be used. This matter should, therefore, be considered first, as it is a determining factor in the design. The accuracy required is also important; and for a rough job requiring only a clearance cut, a simple forming tool can sometimes be used even if the material is unsuited to this kind of cutting.

2. The number of pieces to be machined is important, as on small production it hardly pays to design a generating attachment unless great accuracy is required. Therefore, the simple formed tool will often be found more economical on low-production work.

3. The type of machine used should be selected with care, always considering any other operations which can be performed in the same setting. When a form cut is to be made that cannot be combined with any other operations, it is often possible to adapt an old engine lathe, applying to it the necessary forming or generating attachment. Attention should always be paid to the type of machine most suitable, in order to combine operations and obtain maximum efficiency in this way. Before attempting to design any generating or forming attachment, complete data should be obtained regarding sizes of the various parts of the machine to which the attachment is to be applied.

4. The rigidity of any tool used in production is an important factor. This is a point which is often overlooked in design; and as a consequence very light cuts must be taken in order to avoid chatter, and much time is therefore lost. Sliding or moving members must be rigidly supported and of sufficient section to withstand the cutting strains. A generating or forming attachment usually has moving parts which must operate freely, yet at the same time there should be no looseness or weak members which would tend to cause vibration.

5. The convenience of the operator should be studied when designing fixtures. In connection with the setting of the tools and the adjustment of them, the setscrews should be suitably placed so that they are easy of access. If tapers are to be produced by a generating attachment, the taper bar should be easily accessible; if adjustable, suitable provision should be made so that proper measurements can be taken of the angle of the taper. Other points in connection with convenience of operation will be taken up during the treatment of taper and forming attachments.

6. The flexibility and up-keep of generating attach-

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ments should be very carefully considered when designing. There are cases when a tool must be designed to operate in a confined situation, and where there is little

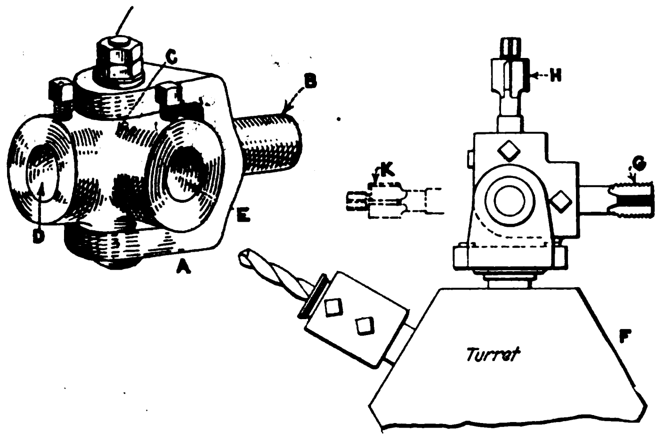


FIG. 355. ATTACHMENT TO HOLD TWO TOOLS ON ONE TURRET FACE

chance to make it adjustable so that other sizes can be handled. In many instances, however, a little forethought on the part of the designer will enable him to design the attachment so that it can be used for a considerable range of work. It is very disappointing to find that a slight change in the design of the part requires an entirely new generating fixture, particularly if it appears that the tool could originally have been designed with greater latitude and at practically no more cost.

In providing for up-keep, it is important to make sure that all surfaces subject to wear should be so arranged that replacements are possible, in order that the tools can be kept in good condition for a long period of time. Adjustable gibbing should be provided wherever necessary. The cutting tool itself should be conveniently replaceable, and a suitable gage should be furnished for setting it to the correct size if the conditions of the work require it.

Duplex Attachment

Mention has been made of the occasional necessity of using more than one tool on a single turret face. While this condition is not often found, yet it is frequent enough to deserve consideration. When the addition of one tool to a turret "set-up" will avoid the necessity for a second operation, it is obvious that a considerable saving can be effected by the use of an attachment which will permit the extra tool to be used along with the others.

In Fig. 355 is shown an attachment of this kind at *A*. The body of the tool is furnished with a shank *B* which fits the turret hole. An indexing member *C* is held in the body of the tool in such a way that it can be readily indexed. Two holes are provided at *D* and *E* to receive the tools required. The illustration at *F* shows the application of the device to a turret set-up. The tap *G* and counterbore *H* can be used progressively on a single turret face. The dotted lines at *K* indicate the position of the counterbore while the tap is being used. A 90-deg. indexing movement is used on this attachment, and suitable stops and an index pin are provided to give the correct location when indexing.

Mention has been made of the possibilities of forming certain kinds of materials with a plain forming tool. We have taken up previously the design of circular forming tools and other tools of a similar kind used on the cross-slide. It is often possible to design a tool for taper work in such a way that it can be applied to the turret of the machine. Tools of this nature are not generally adapted to alloy steels or other materials of a tough and "wirey" nature.

In Fig. 356 is illustrated the application of roughing and finishing tools for a piece of tapered work shown at *B*. The holder *C* is a casting which is fastened to the turret in some convenient manner. The forward end of this body is faced off at the rear so that the cutter *D* can be mounted upon it as shown. Adjustment for diameter is allowed by the two slots at *E*, and the cutter blade is held in place by the setscrews *F*. By mounting the cutter at the rear of the body of the tool, all of the thrust of the cut is taken by the solid member and no great strain is imposed on the setscrews. The

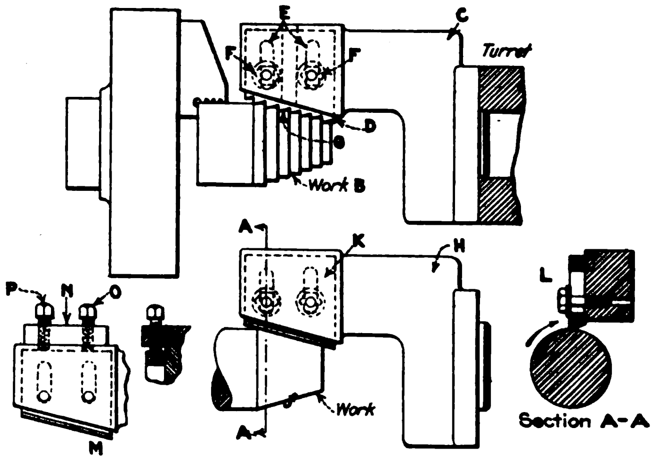


FIG. 356. TAPER-FORMING TOOLS ON TURRET

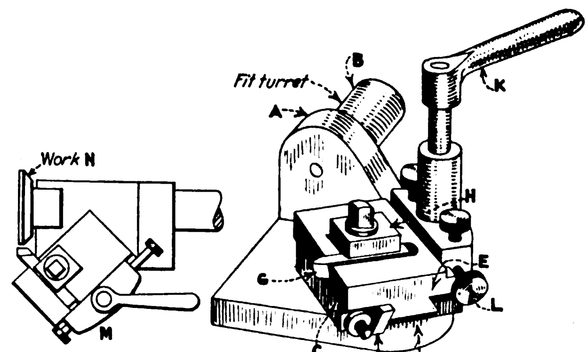


FIG. 357. ADJUSTABLE TAPER-TURNING TOOL

angular edge of the tool is serrated at *G* so as to make the cutting action easier and break up the chip.

The finish operation on the taper is done by a tool of similar form, shown at *H*. The body of this tool contains a single cutter blade *K*, which has a plain edge for finishing the work. The adjustment of the tool is made in the same manner as that previously mentioned. The sectional view at *L* illustrates the simplicity of this design, but it will be evident that no provision is made for fine adjustment, the operator being obliged to adjust the tool by the "sledge-hammer" method. Both roughing and finishing tools are tongued, so that they fit the tool body and are thus kept in alignment.

A refinement of this design which permits more accurate adjustment to be made, is shown at *M*. A plate

N is fitted to the top of the block, and contains two adjusting screws *O* and *P* by means of which the cutter can be readily adjusted to a given diameter. This type of taper forming tool is simple in design and economical in manufacture. For low-production work on suitable materials it can often be used to advantage.

Adjustable Taper-Turning Tools

For light cutting when it is not necessary to remove a great amount of stock and when the work is of small diameter, an adjustable turning tool like that shown in Fig. 357 will often be found useful. The holder *A* has a shank *B* which fits the turret hole. On the body of the tool a swiveling unit *C* is mounted so that it can be swung and clamped in different positions, according to the angle of taper required. The body of the tool is graduated at *D* to assist in setting. The member *E* is dovetailed to fit the swiveling member *C* and an adjustable gib is provided at *F* in order to take up wear. The tool *G* is conveniently mounted in the slide *E* and clamped in place by means of a strap *H*. The slide is moved by means of a rack and pinion, the latter being operated by a handle *K*. The device is furnished with an adjustable stop *L*, which can be set to control the travel of the slide.

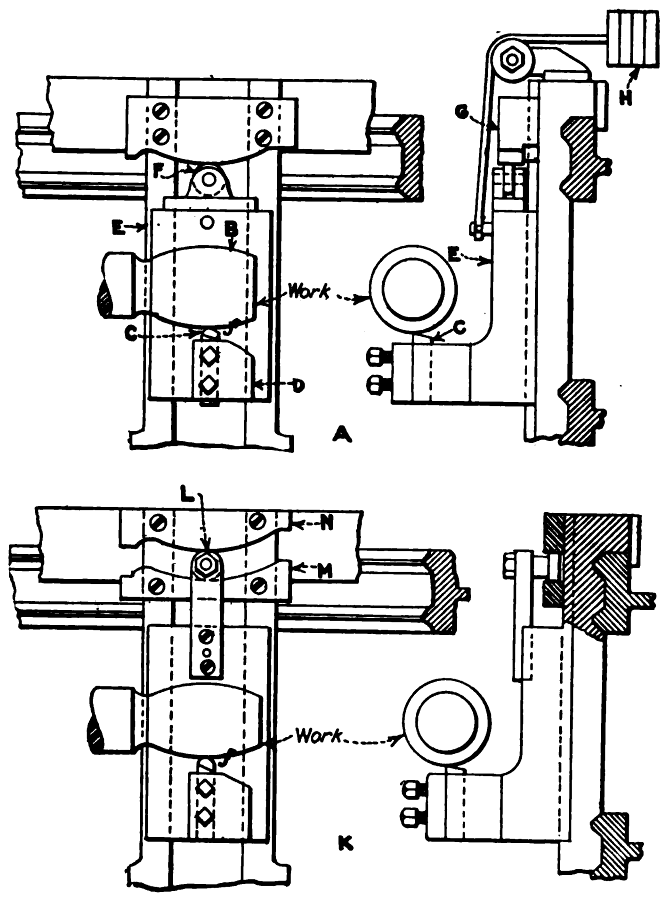


FIG. 358. FORMING BY THE GENERATING METHOD

The application of this tool is shown at *M;* the work *N* has a short and blunt taper cut on it. It is necessary only to adjust the swivel to the correct angle and operate the slide by hand when generating the taper. The advantage of this tool is in the adjustable feature, and also in the fact that it is a self-contained unit which does not interfere with any other tools. For certain kinds of work where the same taper is to be produced continually, a device of this kind can be made up without the swivel member. The taper of the slide is made to suit the work for which it is intended. This simplifies the construction slightly, but there is no chance for adjustment.

When forming or generating attachments are used, there is generally a spring or weight by means of which the roller or follower is kept in contact with the form which is to be reproduced. The direction in which the pressure is applied is important, and there are many forming attachments designed which are incorrect in principle, yet which will many times produce good work if the material being cut is not too hard. The form which controls the shape of the cut should be so placed that the follower can never lose contact with it under any circumstances.

This matter is illustrated in Fig. 358, and the principles shown there should be clearly understood before attempting to design forming attachments. In the example at *A* the work *B* has a curved contour, which is to be generated. The tool *C* is held in a block *D* mounted on a floating slide *E*. At the end of this slide there is a roller *F*, which is kept in contact with the form *G* by means of a weight *H* or a stiff spring. If this weight should not be sufficiently heavy to keep the roll in contact with the form at all times, the tool *C* might be forced out of its position due to the hardness of the material, so that a true contour would not be obtained. If the work to be machined is a casting and many hard spots are encountered, the finished work is especially likely to be inaccurate.

A method which can be depended upon to reproduce the form accurately, no matter whether the work is hard or soft, is shown at *K*. In this case the pressure is applied against the roll in the direction indicated by the arrow at *L*, so that the roll is continually against the plate *M*. There is a guard plate *N* used simply to prevent any drawing-in action of the tool into the work. This guard plate is seldom necessary, except in cases of very severe cutting or where the pressure of the cut, due to its shape, is likely to overcome the pressure of the spring or weight. The pressure of the work against the tool assists the spring or weight to keep the roll in contact with the form *M*, so that an accurate shape is produced.

In considering the use of springs or weights, it will generally be found more convenient to use springs, as they are less likely to be in the way. The springs should be proportioned so that they will give sufficient pres-

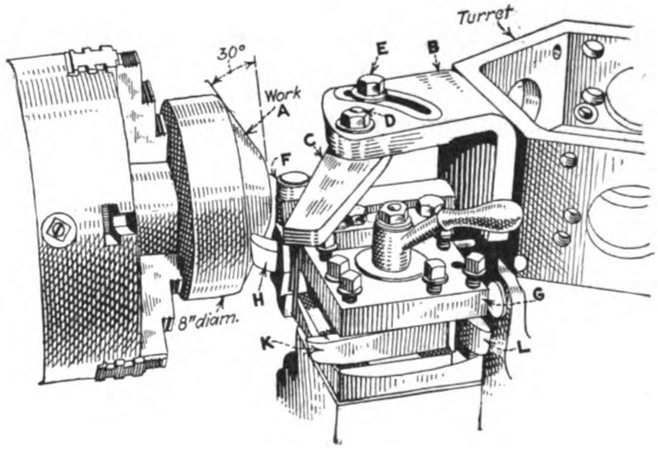


FIG. 359. SIMPLE METHOD OF GENERATING A TAPER

sure to hold the roll firmly against the form plate. The principles indicated in this illustration are fundamental in their nature and are not to be considered as hard and fast rules. For various reasons it may be found necessary to make forming attachments which are not strictly correct in principle, yet which will give good results under the conditions where they are used. The designer must be governed by the shape of the form and the amount of material to be removed.

Generating a Taper

The method used for generating any sort of a taper should avoid tying up the machine so completely that other tools cannot be used. It is possible to prevent this trouble by employing a very simple arrangement, such as that shown in Fig. 359. The work *A* has a 30-deg. angular surface, which is to be turned, but which is too wide to machine properly with a flat-blade tool.

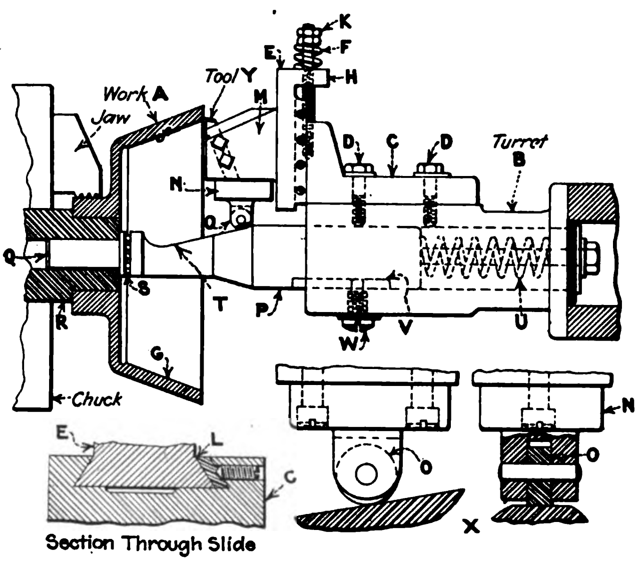


FIG. 360. GENERATING TOOL FOR BORING TAPER HOLE

As other tools are to be used in connection with the turning operation, it is desirable to leave the turret and cross-slide free, so that they can be used for other tools. A bracket *B* is mounted on one of the faces of the turret.

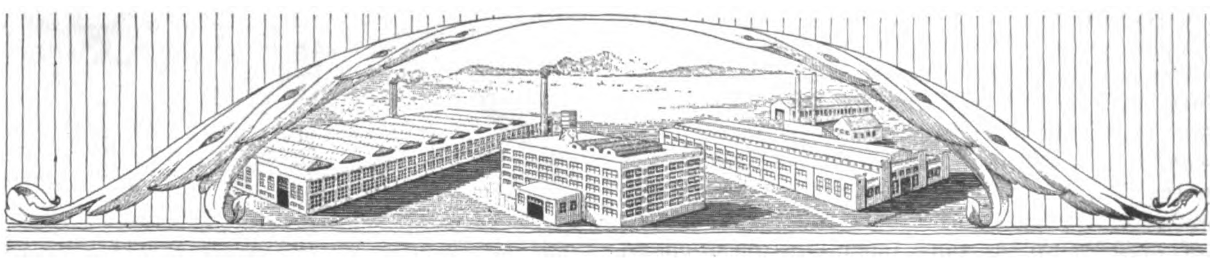
To the under side of this bracket a hardened steel plate C is adjustably fastened. This plate pivots on the bolt *D*, and it can be set to any angle within its capacity after loosening the nut *E*. A special holder carrying a roller *F* is located in one face of the cross-slide turret toolpost *G*, and a tool for turning the taper is provided at *H*. Other tools are used in the turret toolpost at *K* and *L* for other operations on the work. When using this attachment, the roller *F* is held firmly against the side of the plate *C* and the crossfeed of the machine is thrown into engagement, thus causing the tool to travel along the angle at which the taper plate is set. An arrangement of this sort will be found very convenient for many kinds of taper work and its simplicity and ease of adjustment make it extremely useful.

Holes of large diameter which are to be bored to a taper are most conveniently machined by means of a taper attachment. An example of this kind is shown at *A* in Fig. 360. The inside surface *G* is to be bored to an angle of 20 deg., and it would not be good practice to attempt to do this with a flat-blade tool or anything in the nature of a reamer. The holder *B* is mounted on the face of the turret, and on the upper face of it the bracket *C* is fastened, being held in place by four bolts *D*. The slide *E* is fitted to a dovetail on the face of the bracket *C*, and the spring *F* exerts pressure on the overhanging lug *H*. The amount of this pressure can be regulated by adjusting the locknuts at *K*. A sectional detail of the slide with a tapered gib is shown at *L*.

On the under side of the toolholder *M* a block *N* is fastened in such a position that it carries a hardened roller *O* that is used to control the movement of the slide. A detail of the roller and holder is shown at *X*. The body of the tool *B* carries a pilot bar *P*, the small end of which *Q* enters the bushing *R* in the chuck. A ball thrust bearing *S* is suitably mounted on the pilot bar so that it strikes the face of the bushing. The upper part of the bar is cut away at *T* to the angle which is to be generated. The bar is a sliding fit in the body of the tool, and a heavy coil spring *U* is utilized to keep the pilot in position against the face of the bushing *R*. In order to prevent the bar from turning, the keyway is cut at *V* and a special screw *W* is inserted in the slot.

In operation, the device is entirely automatic after the turret feed has been engaged. The ball thrust bearing *S* remains in position against the face of the bushing, and the body of the tool carrying the slide moves forward while the bar remains still. The pressure of the spring *F* forces the roller *O* down against the tapered portion *T*, thus causing the tool *Y* to generate the taper according to the angle on the bar. This type of taper boring tool can be applied to either a hand or automatic machine. Adjustments for diameter within the capacity of the attachment are easily made by moving the tool.

Care should be taken in the design of tools of this sort to make sure that all parts are sufficiently heavy to withstand the cutting action. Replacements of tools should be provided for, and readjustments for wear. The pilot and thrust bearing are very important, as the former assists greatly in supporting the tool, while the latter reduces friction. Bars having different tapers can be substituted for the one shown if it is desired to cut other angles.



Shall We Standardize Tapers?

The Opinions of Many Firms Making and Using Tapered Members—Nearly All Want a Standard—What Shall It Be?

THE standardization of any machine part involves numerous problems. A very few oppose all standardization; more want to standardize on the particular thing they are using and some are willing to adopt whatever the majority consider best for the purpose. Nearly everyone admits the desirability of uniform practice, not so much for interchangeability of tools as to avoid confusion and the necessity of numerous gages, and to reduce the number of tools to be carried in stock.

The question of a standard taper for machine tools was broached some time ago and a canvas of machine-tool builders and users yielded some interesting results. With three or four exceptions all believed a single standard was desirable. A number doubted that it could be secured except at a prohibitive cost, while a few considered it worth almost any price, providing its adoption could be gradual and the cost spread over a few years.

The Morse taper has by far the most advocates, particularly for drilling machine and lathe use, while the Brown & Sharpe taper holds the lead for milling machine use. Much of this preference for the Morse taper is due to its wide-spread use on drill shanks, although it was perhaps the most criticized of any on account of the varying degrees of taper used in the different sizes.

The Jarno taper has many friends but few users. Those who use it, however, find it perfectly satisfactory, except for a few criticisms as to its length; in fact the length of the Brown & Sharpe taper is also criticised in a number of cases.

The simplicity of the Jarno dimensions and the logical manner of arranging the sizes, as compared with the arbitrary selecting and numbering of the others, adds greatly to its popularity. Then there are a few other tapers such as the Sellers with its key or spline instead of a tang.

The Brown & Sharpe taper is preferred for milling machine work on account of its smaller angle, holding milling cutters more securely against loosening under a cut. This, however, loses its significance on the modern milling machine as heavy-duty cutters require more than the friction of a taper shank to drive them. Draw-in rods and key drives of various kinds are being used more and more for this work.

Extracts from some of those who are interested in the standardization of tapers are of special interest and are given herewith. As some objected to being quoted, all are given without identification. They are nearly all however from representative firms in various lines and seem to fairly represent the general feeling.

Several advocate a new or compromise taper, between the Brown & Sharpe and the Morse. They object to the Jarno taper as being nearly the same as the Morse, although having the advantage of uniformity and logical sequence. A new taper would evidently add to the confusion and it would seem better, all things considered, if a change is to be made to adopt a taper already in use. This would probably favor the Morse taper in spite of its lack of uniformity. It would cause less confusion than any other change and might be an advantage in most cases. The milling machine men would be most affected and might not consider it advisable to change, but would probably do so if it seemed best for the industry.

The opinions follow:

Morse Heads the List

No. 1. We believe that this matter will narrow itself down eventually to one uniform taper, and in the case of engine lathes and turret lathes, we are firmly of the belief that the Morse taper will be adopted as the universal standard.

The more we simplify these various standards the better it will be not only for the machine tool manufacturer, but also for the buyer.

No. 2. We are very much in favor of a standardization of the tapers used in spindles of machine tools. While we do not use any tapers in the machines we manufacture ourselves, we are nevertheless users of various types of machines and believe the standardization of tapers would be very much to our advantage. We find in our experience that the Morse taper is the taper most generally used in our works and this taper would be very satisfactory to us.

No. 3. In our opinion either the Brown & Sharpe, the Morse or the Jarno tapers would make a satisfactory standard. The proportions of the Morse taper are beyond a doubt more practical than those of the Brown & Sharpe or longer standards, for the reason that the deeper the taper hole the more difficult it is to accurately machine it, yet it must be deep enough to insure the proper alignment. The Morse taper seems to fill the bill in this respect. The chief fault to find with the Morse taper is one of engineering detail, in that the taper per foot is not the same in the different sizes and the diameters at the large and small ends are not even dimensions. From a practical standpoint, to our mind, this has no real bearing as it is just as easy to make them this way as any other.

No. 4. When the subject of standard tapers was mentioned, it immediately started an argument, and we find that different people in this organization do not agree. So we imagine you are going to have your troubles in getting a general agreement. For your information, however, we might advise that our superintendent prefers the Jarno taper. Other choices are—first, the old Pratt & Whitney $\frac{6}{10}$-in., and second—Brown & Sharpe ½-in. to the foot. Perhaps we might say that the Jarno taper seems to be in favor, as the old Pratt & Whitney and the Jarno are practically the same.

Two More for Jarno

No. 5. The Jarno 0.600-in. taper per foot would seem about right. I have heard an occasional citicism of the Brown & Sharpe ½-in. per foot taper on the grounds of holding in tools to the extent of rupturing the metal when released. When using steep angle end mills or undercut cutters where there is a tendency to draw into the work, it is necessary to use a threaded shank or tap the shank of the cutter for a holding rod.

At first glance, it would not appear difficult or expensive to take care of a new taper in connection with drills, small cutters, etc., by one of two methods: the use of collets with the new taper externally and old taper internally, or, the better way, by regrinding and finishing all collets that could be made over into the new standard as well as the drill shanks, cutters, etc. This, of course, would mean refinished arbors and bars of all description, as well as the bore of the machines, but once this job was done the advantage would be evident.

No. 6. We think that a suitable standard should be

adopted and a standard taper per foot should be used for all sizes of work. It is our opinion that either the Brown & Sharpe taper of ½ in. per foot, or the Jarno taper of 0.600 in. per foot should be adopted. We think for milling machine construction, that the Brown & Sharpe taper of ½ in. per foot would have a little advantage over the Jarno taper, as the Brown & Sharpe taper would have a tendency to hold better and not loosen as easily as the Jarno. However, most milling machines being built today have arrangements for drawing the taper arbor securely in place. With this in mind, we cannot see why the Jarno taper could not be used just as well in milling machine constructiou. We know that it would work out O.K. as far as lathe centers are concerned. In fact, we think it would be superior in lathe construction as a lathe center is always being forced back into the taper fit. The only place where we can see there would be any trouble at all by using the Jarno taper would be in small machines where taper arbors are used with nothing to drive them but the taper fit. Furthermore, we think that there will be less confusion if the Jarno taper is adopted, as the Morse taper is quite universally used and same is very close to 0.600 in. per foot. We cannot see where there would be any serious objection to adopting this taper.

Doubts Value of One Standard

No. 7. The value of one standard taper is questionable, because of the variety of uses to which taper shank tools are put. The Brown & Sharpe taper is unquestionably superior for milling machine work, because the greater the taper the easier it is to loosen the shank in socket, due to jarring in operation; but a greater taper is more satisfactory in drilling machines and boring machines, on account of ease of extraction.

If a standard taper is adopted, it would necessarily be a compromise, and it would seem advisable to adopt the Morse in preference to any other, for the following reasons:

It is approximately half-way between the Brown & Sharpe ½-in. and the ¾-in. used by Sellers and a few other machine tool manufacturers, although there are rare instances where tapers greater than ¾ in. per foot are used. The use of tapers greater than ¾ in. or even ⅝ in. per foot is very limited indeed when compared to the use of Morse or Brown & Sharpe. The Morse taper is used to a much greater extent than any other, as the more common small tools are regularly made with Morse taper, such as twist drills, machine reamers, milling machine tools and lathe centers and sockets. The Brown & Sharpe taper is used, except in few instances, on milling machine tools. While theoretically, the Jarno taper makes a strong appeal, its advantages are more or less academic, and it has certain practical disadvantages, as follows:

Its use as compared to the use of the Morse taper is very slight indeed. There are nineteen sizes covering the same range as covered by seven sizes of the Morse. This would mean the use of a corresponding number of so-called sleeves and sockets, provided it were possible to obtain small tools with Jarno taper shanks. Small tools with the Jarno taper are regularly furnished by few if any manufacturers other than Pratt & Whitney Co., and even they list a much greater number and variety of tools with Morse taper than with Jarno or any other. There is a natural disinclination to change, even when it can be shown that there is a potential profit in doing so, and, therefore, there is an added difficulty in this case when confronted with the fact that there are few regularly manufactured tools with Jarno taper shanks, because there would be problems of special prices, delays in delivery and other inconveniences such as are experienced when special tools are ordered.

Every effort would be made by us to support a single standard if one were adopted by a majority of representative machine tool manufacturers, but it is felt that no great hardship would be noticed if the Brown & Sharpe taper were continued in use for milling machines, and the Morse taper adopted for other machine tools.

No. 8. If we were all starting new, we think the Jarno taper would be the best one to adopt, as all dimensions come in eighths or tenths of an inch. This is the only reason why we prefer it. The Brown & Sharpe and Morse tapers are so well established, and there are so many manufacturers fitted with standards to produce these tapers that we would not think it advisable to change to a new standard that has not any advantages other than even figures. We agree that the Morse taper would be proper for lathe spindles, but think it is bad practice to use drills in footstock spindles.

The Morse and Jarno tapers are so nearly alike, that it might be possible to use the Morse drills in the Jarno spindle and do no more damage than if it was a Morse spindle. To be sure that Morse taper drills will not be put into spindles there would have to be more of a difference than there is betwen a Morse and a Jarno taper. Our unbiased opinion is that it would be best to continue with the Morse taper on lathe spindles.

No. 9. The drilling machine manufacturers use the Morse taper; the twist drill manufacturers use the same, and it is also used on lathes to a very great extent. Much manufacturing is based on using the Morse taper and to make a change to one of the others would certainly involve more than the happy thought that it would be good if such a change were made. Then again, there are other manufacturers who use the Brown & Sharpe taper and they would feel the same way about it.

No. 10. We use mostly Brown & Sharpe and Morse tapers but feel that one or the other should be adopted as a standard taper. In fact, we also believe that all machine tools, especially engine lathes, should be more standardized. As for instance—the swing of the lathe and the weights and dimensions, so that customers would know what size lathes they are really buying.

No. 11. All of our milling machines and gear cutters are equipped with the Brown & Sharpe taper. All of our drilling machinery, lathe spindles and floor type of boring machines have the Morse taper. In as much as it is not necessary in our plant to exchange any equipment between these two types of machines, we never experience any difficulty and it would seem to us that as these tapers are more or less of an old standard, it might be well to stick to them.

No. 12. So far as the style of taper is concerned, the leading makes of milling machines are quite well established on the Brown & Sharpe standard. There is, however, no standardization as between different sizes of milling machines, so that there can be no free interchangeability of tools and arbors on milling machines of the same make but of different size.

The adoption of a standard taper hole in the spindle is not sufficient to enable free interchangeability or arbors, unless the spindle noses are also standardized, since it is now quite common practice to provide arbors with a clutch drive, and unless the clutch drive fits the spindle nose, it of course, cannot be used no matter if the taper on the arbor is exactly the same standard as the taper in the spindle of the machine.

Opposes Standardization

No. 13. What would be gained by having the tapers of all milling machines and lathes exactly the same? Nothing except that it might be a little handier for the users of different kinds of tools. In a milling room of course they could use the arbors of one machine on another, etc., but the life of the machine tool business is the fact that it is not similar in design. The salesman has a good talking point if he has a machine that is just a little different from the other fellow's. The nearer we come to the same design in various ways the less ginger there would be in the business. The slight discommodity caused by having in any factory various designs of tools, is not worth giving consideration.

I am not in for unformity in this particular line in any way, shape or form. I believe in going ahead and thinking as you please and bringing out somthing radically different from anyone else. This applies to the depth of bed of the machine, the height from the table to the cutting tool and various other things in connection with the machine that would be just the reverse from my neighbor's product.

(To be continued in next week's issue.)

Tools and Methods in a Railroad Shop

A Grooving Tool for Locomotive Pistons—A Set of Spiral Crosshead Reamers—Scarfing and Other Tools—Washout Plugs and Taps

SPECIAL CORRESPONDENCE

THE line drawing, Fig. 1, shows a piston grooving tool of the gang type. The toolholder is made to fit the toolslide on the lathe carriage and carries three $\frac{9}{16}$-in. blades or cutters and three at the opposite end which are $\frac{3}{8}$ in. wide. These grooving tools are of way around and again secured in position. This makes it possible to run in the narrow grooving tools, then swing the full width tools into position for finishing the grooves to exact width.

The line drawings, Figs. 2 to 5, give full details of

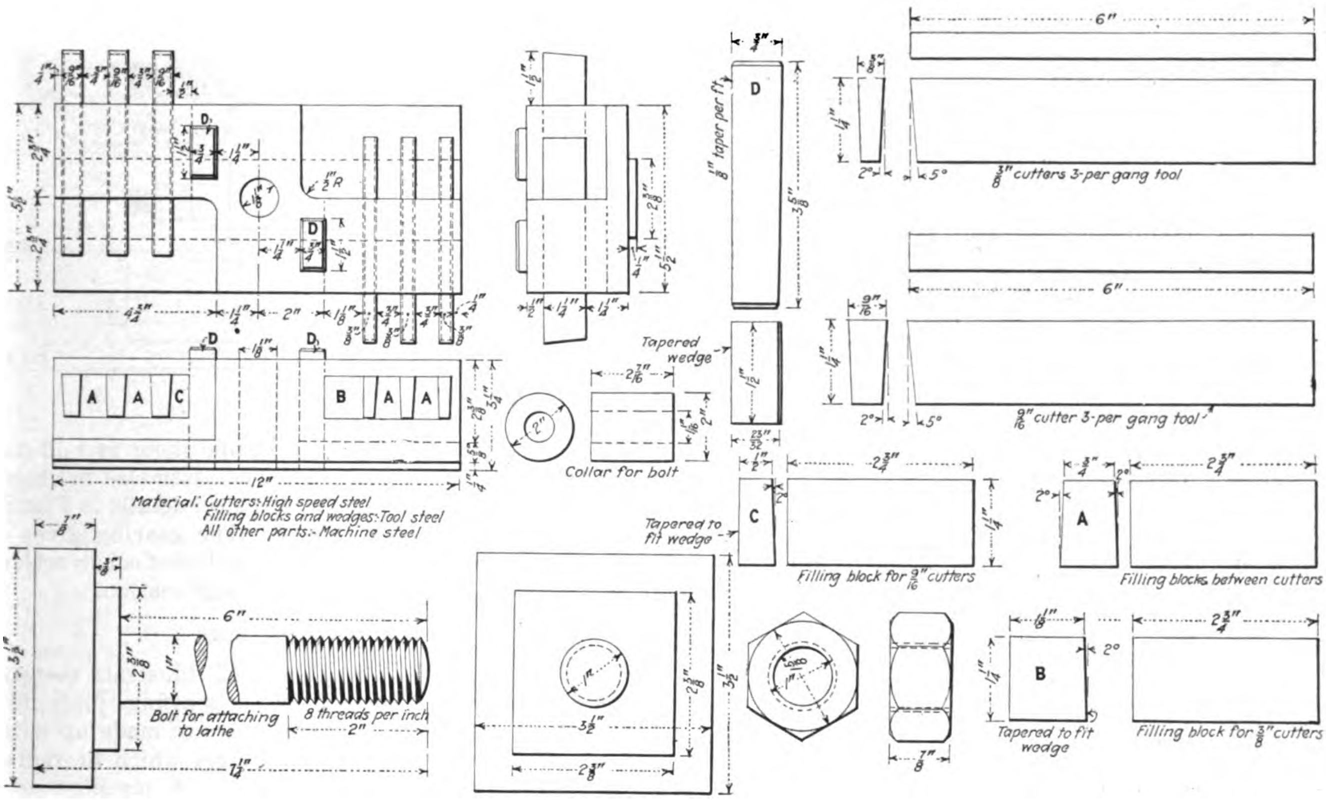


FIG. 1. GANG TOOL FOR GROOVING PISTONS

high-speed steel; the filling blocks and wedges are of tool steel and all other parts are of machine steel.

The toolblock or holder has a $1\frac{1}{8}$-in. hole bored through its center for the upright bolt by which it is attached to the lathe. The underside of the holder is made with a tongue for the regular toolpost slot in the top of the slide. The cutters are made with a 2-deg. taper on each side for side clearance and are ground at the ends to a 5-deg. front rake. The filling blocks or spacers *A* between the cutters are made with 2-deg. taper at the sides in the reverse direction from the cutter slope to fit properly between the cutters, and the inner filling blocks *B* and *C* are similarly tapered on their faces where they match the cutter sides, while their opposite or inner sides are tapered to correspond to the wedges *D*, which serve to lock each gang of blades firmly together. These two wedges *D*, as will be seen, are driven down from the top of the holder into rectangular slots cut vertically through the body of the holder. All dimensions are given on the drawing.

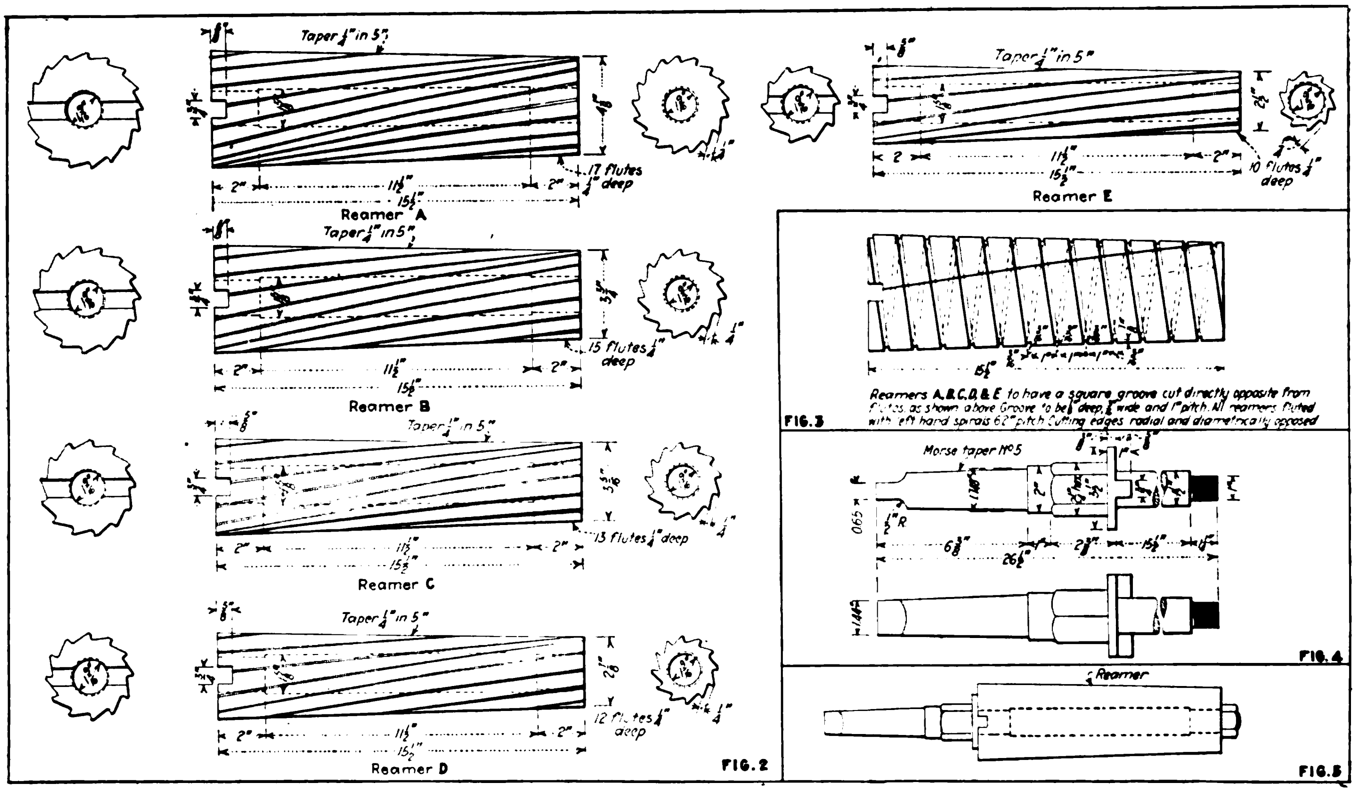
By releasing the clamping nut on the top of the bolt at the center of the block, the tool may be swung half-

a series of spiral-fluted, taper crosshead reamers, the layout covering five sizes. These range from $2\frac{1}{2}$ to $4\frac{1}{8}$ in. in diameter at the small end of the reamers. The number of flutes range from 10 in the smallest size of reamer to 17 in the largest in the series. All sizes are fluted with left-hand spiral cut to a lead of 62 in. in one turn, or as commonly expressed, to a pitch of 62 in. The flutes are cut $\frac{1}{4}$ in. deep and with their faces radial. As shown by Fig. 3, a square groove $\frac{1}{8}$ in. deep by $\frac{3}{16}$ in. wide is milled directly opposite the flutes, to break up the cut. The lead of this right-hand groove is 1 inch.

Reamers and Shanks

The reamers are made independent of the shanks, Fig. 4. The body or cylindrical portion of the shank has a diameter of $1\frac{1}{2}$ in. to receive the hollow reamers. A cross-key is formed on the face of the shoulder on the shank and this key enters a slot milled across the end of the reamer so that when the nut at the end is tightened, the shank and reamer are held securely together. The assembled reamer is shown in Fig. 5.

An interesting form of gage used for testing driver



FIGS. 2, 3, 4 AND 5. DETAILS OF CROSSHEAD REAMERS

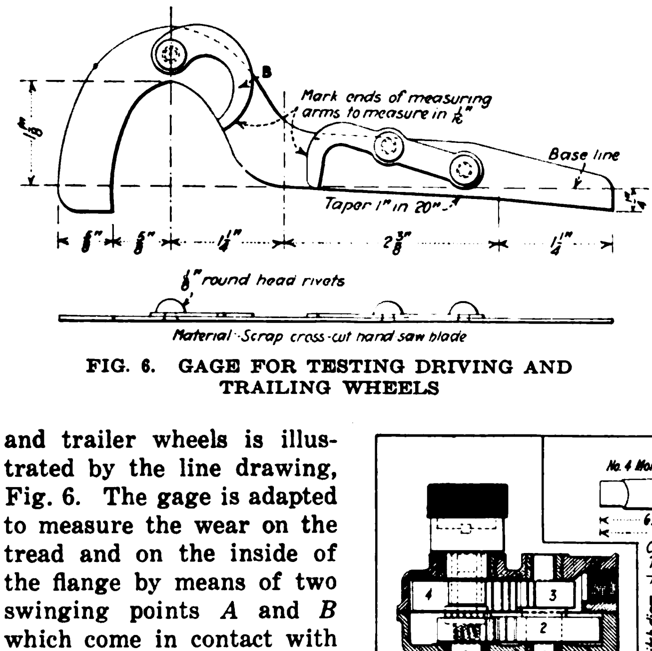


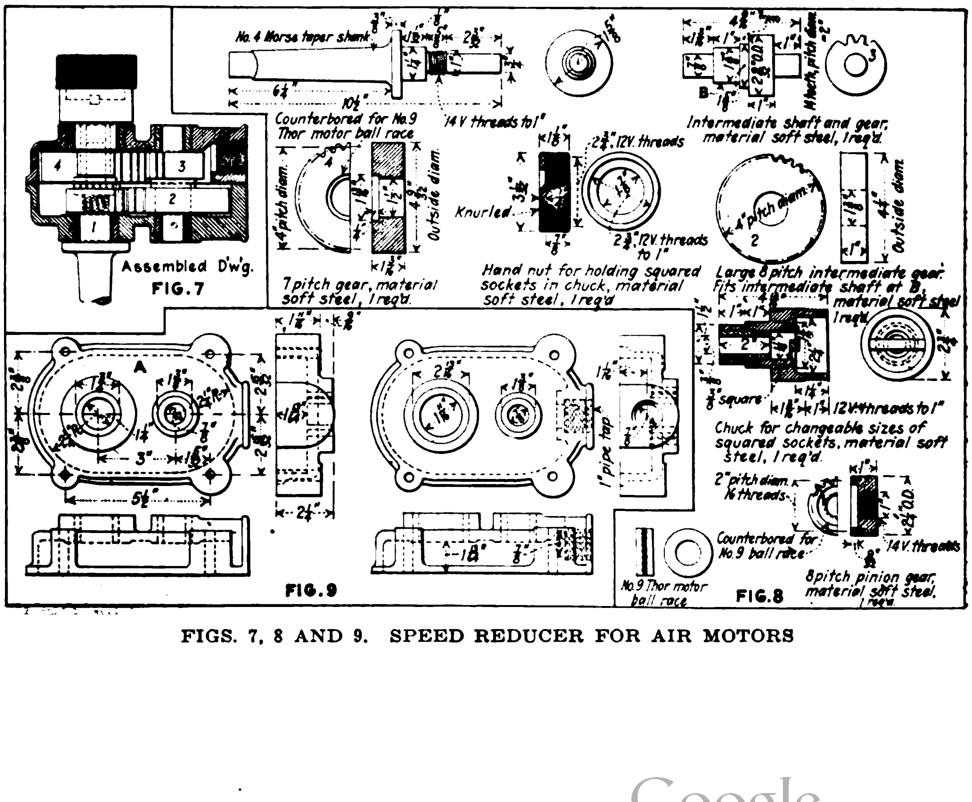
FIG. 6. GAGE FOR TESTING DRIVING AND TRAILING WHEELS

and trailer wheels is illustrated by the line drawing, Fig. 6. The gage is adapted to measure the wear on the tread and on the inside of the flange by means of two swinging points *A* and *B* which come in contact with the surfaces noted. The ends of the hooked-shaped gage points are graduated to read directly in sixteenths, but very much smaller amounts may be read by inspection.

In connection with the use of various classes of large and medium-size tools used in the way of drilling, tapping, seating and other operations, the speed reducer for motors shown in the drawings, Figs. 7 to 9, should be of interest. This device is shown as made at the Southern Pacific shops and all details are given in the drawing. The assembled mechanism is shown by Fig. 7, the various steel details in Fig. 8, and the casing details in Fig. 9. The gearing gives a four-to-one speed reduction. The method of construction will be understood without detailed explanation.

Miscellaneous Tools

The drawings, Figs. 10, 11 and 12, illustrate certain boiler-stop tools. Fig. 10 shows scarfing tools for boiler flue-sheet flanges. These tools are made up with six inserted blades of high-speed steel which fit radial slots in the head of the appliance. A machine-steel sleeve fits over the blades or cutters from the rear and



FIGS. 7, 8 AND 9. SPEED REDUCER FOR AIR MOTORS

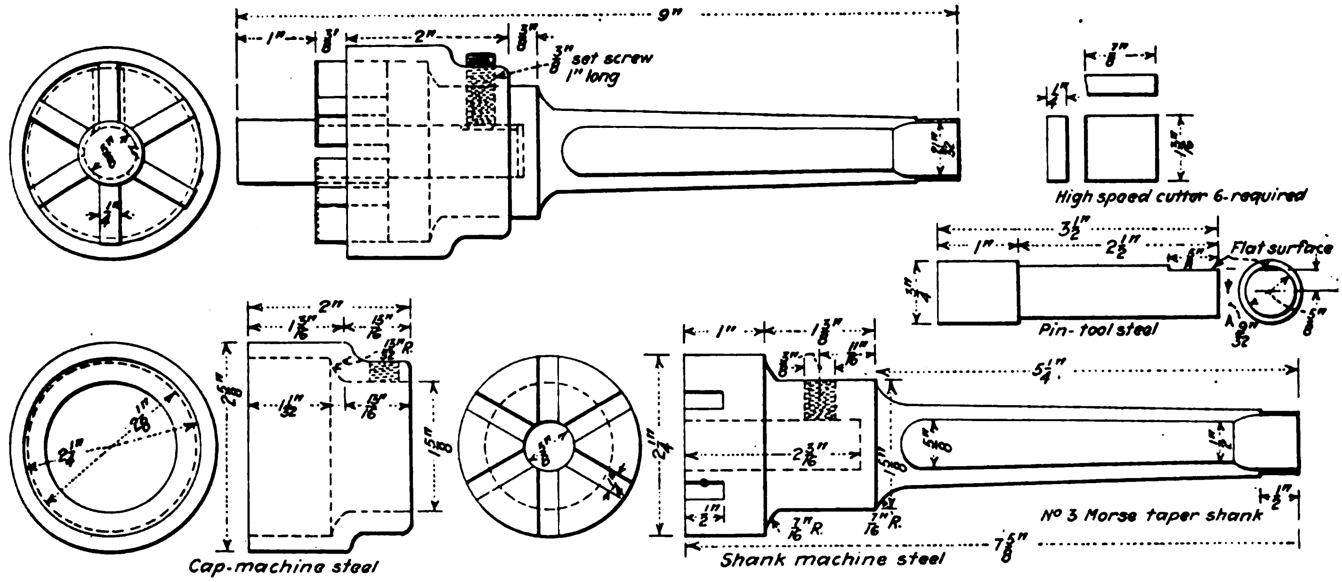


FIG. 10. SCARFING TOOLS FOR FLUE-SHEET FLANGES

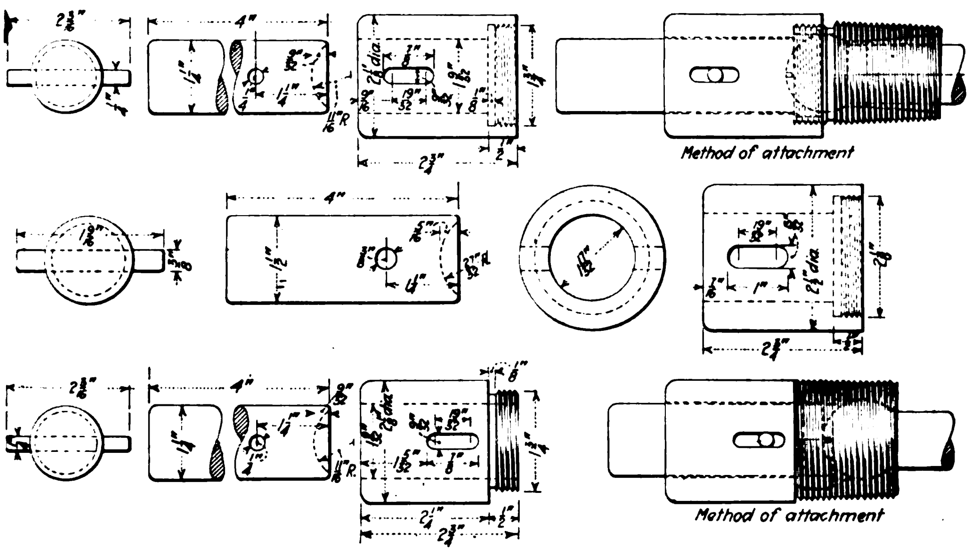


FIG. 11. HOLDING-ON TOOLS FOR RIVETING FLEXIBLE STAYBOLTS

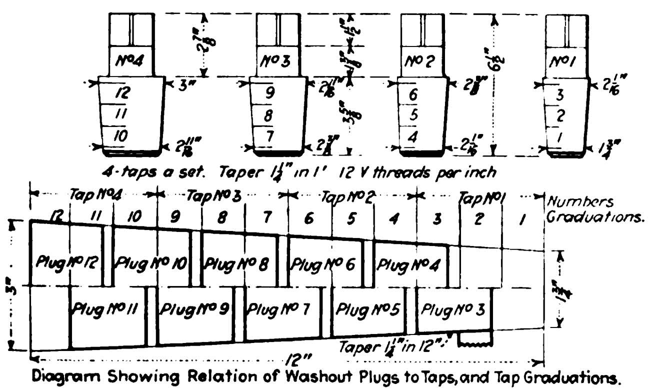


FIG. 12. DIAGRAM SHOWING RELATION OF WASHNUT PLUGS TO TAPS AND TAP GRADUATIONS

this is secured by a hollow-head screw which is tapped through the body and also serves as a holding screw for the pilot pin.

The drawing, Fig. 11, shows holding-on tools for riveting flexible staybolts. Full details are given on the drawing, and the method of application is so clearly shown as to require no explanation.

The diagram, Fig. 12, shows the relation of washout plugs to taps and tap graduations. Four taps make up the set, all cut to 12 V-threads per inch. The graduations from the small end of the smallest tap to the large end of No. 4 or the largest tap, are marked from 1 to 12, so that there are three graduations to each tap. The diagram at the bottom of the drawing shows how the taps are proportioned to overlap from one size of plug to another, each tap thus taking care of some portion or all of the three plugs in its range. The tools described in this article are shown as made and used in the shops of the Southern Pacific Company, at Sacramento, Cal.

Air-Cooled Suit Designed to Protect Welders

A brief item in the *Journal of the American Welding Society* refers to a new type of air-cooled suit that has been recently invented and which is designed to protect the oxy-acetylene welder from the heat he is exposed to in doing heavy welding in confined places. The inventor claims that the wokman equipped with this suit is protected from the heat by the circulation of the air around his body. The air passes through the mesh of the fabric of which the suit is made. The air is supplied by a pan through a flexible tube fastened to the suit.

In very hot work the helmet is used to protect the welder's head from the heat and also to supply fresh, cool air for breathing.

The suit is also supposed to be a protection against poisonous gases and can be worn for hours at a time without discomfort.

An Old English Machine For Cutting Spiral Bevel Gears

Originally Intended for Making Gear Patterns—Unique Indexing Arrangement — Formers for Controlling the Cutting Angle and the Spiral—Construction of the Spiral

By W. OWEN

I HAVE in my possession a book entitled "A New Century of Inventions," by James White, civil engineer, published in Manchester, England, in 1822. The book is most interesting, and shows many inventions which are, even today, looked upon as relatively new. Amongst these are the curved tooth bevel gear and the method of cutting the same. In view of the recent developments in this direction, particularly in your country, I enclose a copy of this portion of the book, which, as it is probably the first record of this type of gearing, may be of interest to your readers.

The article sheds a vivid light on the engineering literary style of that period, and in order not to disturb the atmosphere, I have left the wording exactly as it is given.

OF A CUTTING ENGINE

For large Bevil Wheels and Models, on the Patent Principle.

One of the most prominent subjects of this essay, if not the most important, is the System of Toothed Wheels, with which the second and third Parts were introduced, and which still claims a share of my readers' attention. As hinted a few pages backward, it seems not enough for me to exhibit and describe the System, but I must defend it against repeated objections, on pain of seeing it's utility delayed, and the public deprived of it's real and solid advantages. I am *far* from wishing to impeach the *motives* of those who still nourish or express dissent, when they deign to bring reasons for so doing; but the mere opinion—"it won't do"—expressed by a man of reputation, may impede, for a time, the progress of an useful discovery, and thus produce a public evil. This, then, is a result I am anxious to avert; as the present System *has* many points of excellence, against which no insuperable objection *can* be brought. Had I not declined, already, to name either the friends or enemies of the System, I might here appeal to persons who highly approve of it; and, indeed, who use it daily with manifest advantage. But, I forbear. If, by means of the Engines already given, and *that* I am going to offer, it is proved, that the difficulty of making these wheels is *trifling*, compared with their utility, one important point will be gained: I shall not hear it repeated, "that the System cannot succeed, *because of the difficulties of it's execution*."

The present Cutting Engine is shown in Figs. 1, 2, 3, of Plate 32. It's immediate use is to form the teeth of *wooden models*, for casting. These are previously *built* as usual, and *lagged* with *bay-wood*, of sufficient thickness to furnish the teeth, and leave a small thickness of *that* wood behind or under them.—*A B*, in Fig. 2, represents a wheel of this kind, ready for cutting;—mounted correctly on the center pin *C D*, which latter is so formed as to be *fixable* in any position on the table or bench *E F*. Under the wheel *A B*, there is a kind of *index a b*, put upon the said center pin *C D*, which, by means of the clamp and screw *b c d*, can be occasionally connected with the wheel *A B* so as to turn it, when it is itself turned by the means hereafter to be mentioned. To proceed with the description: *G* is a slide, moving horizontally on the bench *E F*, as seen at *f e* Fig. 3; this slide being the basis of the headstock *G H*, which contains the *perpendicular slide H I*, itself the support of the cutter-frame *K L*, so constructed as to turn on it's bolt above *I*, and take any proper position over the edge of the wheel or model *A B*. This slide, then, with it's appurtenances *H I K L*, moves along the bench *E F*, as seen in Fig. 3 at *f e:* and what gives it this motion, is, the screw *g*, furnished, purposely, with a left-handed thread, working in the *half-nut* contained in the small frame *h*, which contains also a jointed *cap*, that can be lifted off in an instant, and the screw set at liberty. Moreover, the second use of this screw *g*, is to *be* thus disengaged from it's nut, and lifted up to about *i*, where it serves to push back the slide *G* toward the wheel, without that loss of time it would occasion if pushed back by the working of the screw. The letters *M N*, shew another important part of the Machine, applying to the cutting-process. It is an inclined plane, sloped to the same degree as the bottom of the teeth of the wheel. (See the line *a k*.) This inclined plane, then, is fastened, in any proper place, on the bench *E F*, by the wedge *N*, *just* like the puppet of a common turning lathe; and it passes through an opening in the slide *G I*, or rather suffers this to pass *over it*, as better seen at *M*, Fig. 3. Furthermore, the slide *I* (Fig. 2), after gliding down this inclined plane *M G*, will have to be raised between each cutting: and that is the office of the workman's hand acting on the lever *O P*, through the iron frame *Q M*, which is shewn at Fig. 3, in another direction; and marked with the letters *Q l m*. In fine, the slide *G* carries on each side of the Machine a pulling bar *n*, connected with the said slide, and with a smaller sliding piece *o*, the use of which is to hold a pin (seen in the figure, but leaving no room for a letter of indication), which *turns* the wheel *A B*, by the plate *p*, as the slide *G* recedes, and the cutter-system *I K L* descends on the inclined plane before-mentioned. Having thus adverted to all the important parts of the Machine, we turn to Fig. 1, for the purpose of shewing *what* the plate (whose edge is seen at *o p*) means; and the effect it is intended to produce.

In that figure, let *B A c* be the section of any wheel it is desired to cut on this principle. The width of the face of such wheel is shewn by the line *a b;* and *a c* is called the *projection* of that face, on the base of the cone of which the wheel *A B* is a portion; it's summit being at *C*. The line *e d*, shews *one* of the spiral teeth with which the wheel is to be furnished; and I make it by this uniform process: The pitch of the wheel, whatever it be, is set off from *e* to *f:* and that pitch is divided into *eight* parts, (shewn here as *four* on account of their smallness) while the width of the face *f d*, is divided into *nine* parts, shewn here (for the same reason) by *four and a half* divisions. This latter division is more numerous than the former, that the principle may be a little *overdone;* or that the teeth may overlap each other by 1/9 of the pitch: To which purpose, beginning the spiral line *e d* at *e*, I move in the second circular line from *e* to the second radial line *C i*, and draw *that diagonal* which forms the first part of the curved line *e d*. From this second point, I go to the third circular line, taking also the third radial line, and drawing the diagonal. This I do until arrived at the fifth circular line, when I find myself likewise at the fifth radial line *C d f*. These four spaces thus gone over, represent the eight parts into which this part of the face *a b would have been* divided, had the figure been larger: and there remains a small division near *d*, equal to one half the others, through which the curve *e d* is prolonged by a similar process: and this latter portion is what the successive teeth *overlap* each other, as before stated.

Now, it will be seen below, that the needful *circular* motion is given to this wheel, by a movement that takes place in a direction parallel to the base *a c B* of this figure. The curve *e d*, must, therefore, be transferred from the surface

of the cone, to this base $a\ c$ B. To do this, I place a point of the compasses at A, and trace, with the openings $A\ a$, $A\ c$, &c., the six *quadrants* included in the space $a\ c\ g\ h$, which are now the projections, on the base, of the circular lines $a\ b\ f\ d$ on the surface of the said cone. Here, a slight difficulty should be obviated: strictly speaking, this *projection* would be horiontal, and, of course, invisible in this position of the wheel. But I have supposed the figure $a\ c\ g\ h$, turned ninety degrees downward, round the horiontal line $a\ B$, so as to make one representation suffice; and also to shew the connection of the lines $a\ b\ g\ h$, with those $f\ d\ a\ b$. The curve $k\ l$, is thus a *copy* of that $e\ d$, only *shortened* in the proportion of $a\ b$ to $a\ c$—that is, of the side of the cone $a\ C$, to the half-base $a\ A$.

To secure, then, the coincidence of the pitch, as set off on

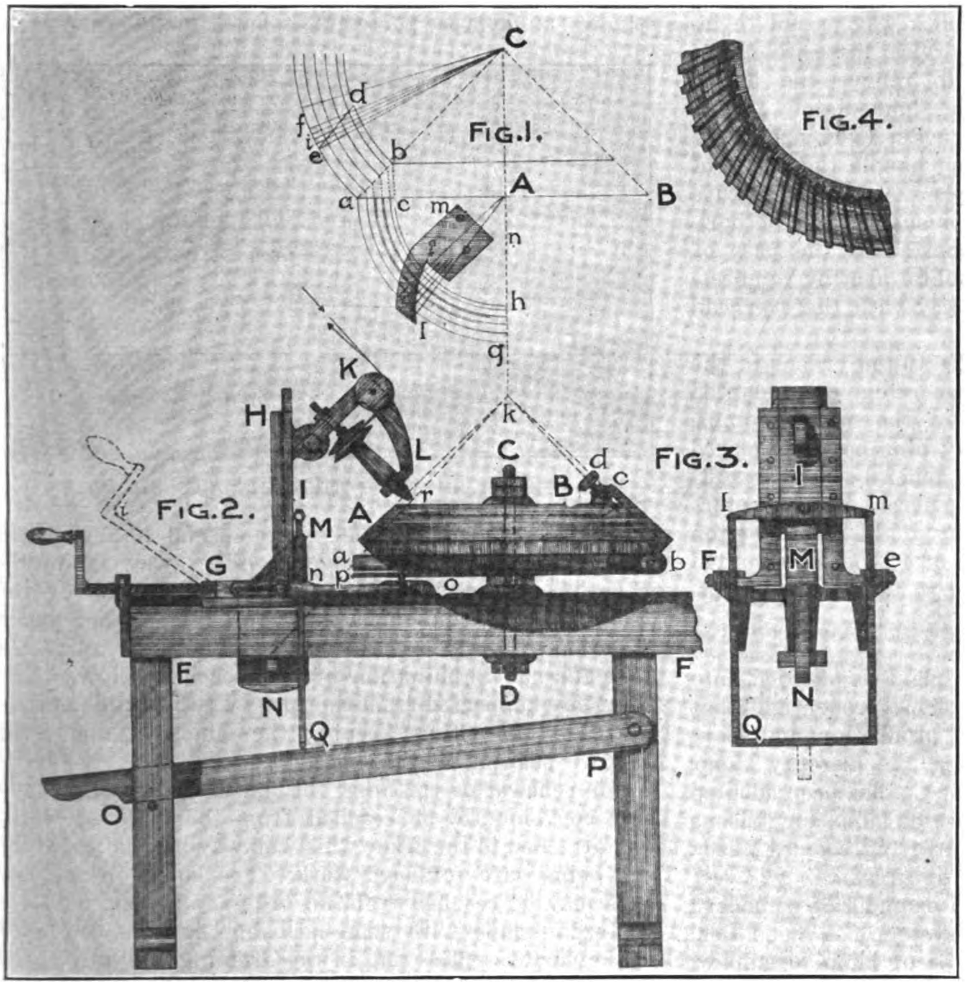


FIG. 1. CONSTRUCTION OF THE SPIRAL. FIGS. 2 AND 3. THE GEAR CUTTING MACHINE. FIG. 4. SKETCH OF PART OF A SPIRAL BEVEL-GEAR

the circumference $a\ f$ and $a\ g$, we must divide a similar portion of both into an equal number of parts, $e\ f$; and treat them, on the lines $a\ c\ g\ h$, as we did on those $a\ b\ d\ f$; by which means we shall get the curve $k\ l$, *the projection of that* $e\ d$. And this curve $k\ l$, must be made part of a *plate* $k\ l\ m\ n$ (about 1/10 on an inch in thickness), the use of which is as follows:

This Plate $k\ l\ m\ n$, is no other than that marked $o\ p$ in Fig. 2; and it is there fixed to the index $a\ b$, directed to the central pin $C\ D$, as it is in Fig. 1 to the center A—insomuch, that the *pin* shewn in Fig. 2 near o, acting on the *sloping* curve $k\ l$, will turn that index (and with it the wheel) by the very motion which draws back the slide G (Fig. 2), and lets down the slide I on it's inclined plane $G\ M$.

We may remark, lastly, that as the present Machine is adapted to *large* models, it is not, now, provided with a dividing-plate, although the means of so doing are self-evident. On the contrary, the division dots are seen on the edge of the wheel $A\ B$, as is likewise one dot, near b, on the clamp $b\ c$, from which a given distance is set off to each of the dots on the wheel, so as to give the pitch required. By these means, then, the wheel is divided and cut, in good, if not in exquisite divisions; and all the teeth take their shape from the Plate $o\ p$ (or $k\ l\ m\ n$ of Fig. 1), and are thus good, in that respect also.

To recapitulate the steps of this process—The workman stands behind the Machine, near E; and, working the screw with his right hand, draws back the slide G, (the *power* then turning the cutter r very swiftly) by which means, the slide I glides down the inclined plane M, and the cutter, impinging on the sloping face of the wheel, cuts it to the depth $r\ a$; the shape of the tooth (by the turning of the wheel) being the spiral form $e\ d$ of Fig. 1. It may be added, that the lifting lever O permits this descent of the bar $Q\ M$, because it is suffered to fall lower than *now* represented. Thus, when the slide G is arrived near h, the tooth is finished; and the cutter leaves the wheel at a: after which, the cutter-frame and slide $I\ K\ L$ are raised by means of the lever O—the screw g taken out of its *steps*, and the slide G pushed back by it, until the vertical slide I rests again on the inclined plane M, as it at first did. Nothing, now, remains to prepare for cutting a new tooth, but to change the division-dot, by the application of the gauge or compasses, from b to the next point on the wheel; to do which, of course, the clamp $b\ c$ must be loosened and refastened by the thumb-screw d. I would just notice the 4th figure—to say, it is a sketch of one quarter of a bevil wheel: intended merely to shew the form and position of these teeth, and the general appearance of the System.

Finally, my readers will please to advert to what has been already said on the *forms* of these teeth, and their uses: and recollect especially what was observed on the epicycloid, as applied to them. It will easily be perceived, that to *put* that form on one of these teeth would be an almost hopeless attempt! —and, happily, it is not necessary. We can, however, by using the cutter r with various slopes, and going several times through each *space*, cut *facets* on the teeth, quite near enough to the theoretical form to make them work *well* together; and, as before observed, nothing is wanting to make the teeth *perfect*, but to run them with the wheels placed in due position.

Safety Code for Grinding Stands

The maximum angular exposure of the grinding wheel periphery and sides for hoods used on machines known as bench and floor stands should not exceed 90 deg. or one-fourth of the periphery. This exposure shall begin at a point not more than 65 deg. above the horizontal plane of the wheel spindle.

Whenever the nature of the work requires contact with the wheel below the horizontal plane of the spindle, the exposure shall not exceed 125 deg. This exposure shall begin at a point not more than 65 deg. above and extend to a point not more than 60 deg. below the horizontal plane of the wheel spindle.—(*From A.E.S.C. tentative standard safety code.*)

An Eastern Shop of Modern Design

Concluding the Description of a Machine Tool Shop—Lighting, Heating and Power Applications—Crane Service and Sanitary Arrangements

By C. E. CLEWELL

THE crane service adopted in the new Gould & Eberhardt plant at Irvington, N. J., consists of two 10-ton Shepard cranes, one in each of the high bays, with one-ton electric hoists in the small bays. In the high bays, a number of jib cranes of special design have been installed in such a way as not to interfere with the overhead crane service, these jib cranes merely serving as a help-out to relieve the larger traveling crane over a small radius immediately around the jib crane. These jib cranes have a 12-ft. arm, have a lift capacity of one ton and can handle the needs of approximately three machine tools. A special feature is the use of a steel angle arm for supporting the horizontal crane arm, which is supported at the base of the crane, thus holding the horizontal arm by compression and not interfering in any way with the overhead crane.

The supporting run-way for the 10-ton cranes in the high bays consists of reinforced concrete and is mounted on concrete brackets as a part of the main columns. On top of these run-ways a heavy pine board is placed as a base for the crane track, this general scheme resulting in quiet operation. Direct current crane motors are used. The supporting run-way of the small one-ton cranes in the low bays is made up of eye-beams mounted on special clamp devices attached to the shop columns.

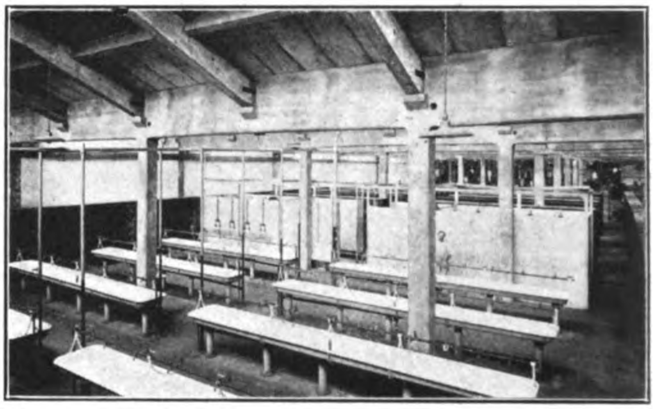
Artificial Lighting in the Shops

The artificial lighting of the plant is divided into two parts, namely, that for the shops proper and that for the offices and the drafting, production and planning departments. For the shops, the mercury vapor lamp of the Cooper-Hewitt Electric Co. has been adopted as standard in preference to the Mazda lamp, for reasons given below. In the offices and drafting rooms, Mazda lamps are used in semi-enclosing fixtures.

These shops contain a splendid example of a modern and carefully planned lighting system. A good deal of attention was given to the type of lamp to employ, the two principal forms considered being the Mazda-C or nitrogen filled lamp with some form of shop reflector, and the mercury vapor lamp. The management felt that it could not afford to use the brilliant Mazda-C lamps in the shops when it was possible to secure the restful effect of the mercury vapor lamp with its relative low brightness and consequent low degree of glare effect. As a result, the entire shops, with the exception of washrooms and stockrooms, are equipped with the mercury vapor units, the Type P lamps for direct current circuits being used in the low bays, and the double-P, or two-tube units being used in the high bays.

One mercury vapor lamp is used per bay, which is closely equivalent to one watt per square foot, a value chosen to insure highly adequate illumination for the work with no need for local lamps. The general distribution of the light from these lamps is such as to produce a low degree of shadow effect and the results of the artificial light approximate those of natural light. No difficulty has been experienced from the spectral character of this type of lamp and no effort is made to correct its greenish color by the use of special reflectors.

The lamps in the central bays are all equipped with regular angle-type porcelain enamel metal reflectors,



WASHROOM SHOWING TROUGHS AND SHOWERS

and those near the side walls have special 45-deg. angle type reflectors for throwing the light away from the walls to the working surfaces adjacent. A row of double-P lamps runs down the high bay aisle and under the crane run-way on each side while smaller units are used for the illumination of the benches below. The lamps are supported from the roof by two flexible chains for each lamp, thus keeping the lamps in one fixed angular position at all times.

For renewal or cleaning, the lamps in the high bays may conveniently be reached from the guarded walkway attached to the crane, this walkway having a railing and being safe for such work. The lamps in the low bays may be reached from an ordinary ladder.

Mazda lamps with semi-enclosing fixtures are used in the various offices and in the drafting and associated departments. Mazda lamps are also employed for the washrooms and stockrooms.

Shop Motor Applications

The application of power to the machine tools used for manufacture in this plant is either by the group motor or by individual motor drive methods. An interesting and important feature connected with the group motor drive is the use of automatic push button control for each group motor. For this purpose, a closed panel box is mounted on a column near the motor, and inside of this box fuses, a mainline switch, a circuit breaker and the contactor switches for starting are mounted. In other words, each group motor has the complete protection afforded by this equipment. On the outside of this panel box an off and on push button is located. The group motors are suspension mounted from overhead steel frame work and belted to a large pulley on the group line shaft.

These shops find considerable use for the adjustable

speed motor and quite a number of the machine tools thus have their own individual motor. For example, the large planers are driven by reversing motor planer equipments, three or four at present being operated by constant speed motors with a temporary frame work for mounting the motor overhead, although these few planers are ultimately to be equipped with reversing motors.

Heating and Ventilation

Heating is accomplished by a system of radiators mounted overhead to act as an insulator for the saw-tooth sash and to expedite the passage of the heat to the floor. Other floor radiators are used at certain locations. The heating is done by exhaust steam and makes use of the differential valve vacuum system with a vacuum pump ranging from 3 to 5 lb. pressure.

Ventilation is provided by hand operation of the sash in the saw-tooth roof, all sash in the high bays being arranged for hinged opening, and 80 of the 160 ft. of sash across the low bays being similarly arranged.

Steel shelving has been adopted for all toolroom bins and also for holding raw materials in the storage spaces. The bar stock, for example, is held in steel shelf compartments, the heavier parts being stored above for the convenience of handling by the overhead cranes, and the lighter parts below are taken care of by hand. The bins for ordinary raw material are open while those for bronze parts are equipped with doors and locks.

Portable Elevators

A valuable aid for quick repairs and also for handling parts at some height above the floor is the use of portable revolving elevators of the Revolving Portable Elevator Co., which avoid the necessity of ladders in many cases and which are of considerable help for puting up countershafting, for oiling and for the maintenance of the overhead group motors and for belt repairs.

Automatic scales are adopted as standard for the receiving and shipping ends of the plant and it may be stated that the railroad track at the receiving end of the shops is at floor level rather than being depressed, as it has been felt that the use of depressed tracks inside the shops introduces an unwarranted disadvantage in the irregularity thus imposed on the floor space. Where it is desirable to unload material with the floor of the car at the shop floor level, a track just outside and along the outer wall of the shop is depressed so as to make this possible.

Where jigs are not available and it becomes necessary to lay out the work in the usual way, a large laying out table is provided near the center of the outer high bay aisle. A small air compressor furnishes the supply for air hammers throughout the shops, the lay-out of the air compressor piping being so designed as to give the necessary flexibility to the outlet locations.

The employees' locker room contains 700 lockers, 12 x 15 x 72 in., provided with locks and keys rather than combination locks. Immediately adjoining the locker room a washroom is located. The management decided that enameled troughs were preferable to individual wash basins, these being in sets 18 ft. in length with faucets high enough to permit of washing under running water. They are shown in Fig. 7.

Washing water is furnished initially from the company's artesian well through a tank, with which a steam coil is used for tempering the water to 110 deg. at all times by thermometer control. Eight shower baths are available for the shop men, with hot and cold water.

The main shop entrance opens directly through a hallway into the washrooms and then into the locker room, from which the shop proper is reached. This sequence is considered most advantageous from the standpoint of convenience and the time involved in reaching these two rooms.

The shops contain one toilet only, centrally located, thus keeping all plumbing at one place. This toilet has a slightly depressed floor and can be completely flushed with water. Unusual care has been given to the plumbing and fittings in this toilet and to complete ventilation. Access to the closet plumbing is furnished by side doors and a passage which extends the full length of the room.

Separate toilets and washrooms are located adjacent to the offices and near the drafting rooms. An ingenious wardrobe supporting holder is found in the clothes closet of the offices, which is constructed from simple pipe and pipe fittings with a wire screen above for hats.

Drinking fountains are placed throughout the shops, furnished with water from the local well, and each one provided with a sump below the fountain pipe standard for drainage. Provision is made at each drinking fountain for a hose connection for washing the floor. Among other sanitary provisions there may be mentioned the complete exhaust system for the removal of dust and dirt in connection with the polishing machines.

Hospital Facilities

Near the main shop entrance a liberal space is enclosed for hospital purposes. This room is completely covered with white enamel including the roof trusses. It is fully equipped.

The completeness of the sanitary arrangements is merely one indication out of many which might be mentioned, to show the thorough manner in which these new shops have been planned. This particular company in moving from old quarters with years of experience under more or less limited manufacturing conditions, was in a position to give deliberate attention to many refinements in the equipment and in the general lay-out of departments, which makes these shops, as a whole, highly satisfactory for the purposes for which they were designed.

Refinishing the Bores of Internal Combustion Motors

By S. M. Ransome

As has been pointed out in recent issues of the American Machinist, an increasingly extensive line of mechanical work is opening up in refinishing the cylinder bores of the 9,000,000-odd gasoline motors now in use in this country.

A worn cylinder bore presents to the unobservant or unmechanical eye the appearance of a well polished and apparently round and true hole; but a little measuring soon discloses the fact that the bore, though smooth, is no longer round or parallel, but is enlarged toward the upper end and is somewhat oval in places. There may also be a worn spot caused by the "kick" of the piston at the extreme ends of the bore.

The next consideration is the thickness and stiffness of the metal to be machined. Here again appearances are deceptive, as to the casual observer the walls present an almost solid appearance, whereas we know that what we really have is a cast-iron pipe of uncertain thickness, usually ranging between $\frac{1}{8}$ and $\frac{1}{4}$ in., unsupported in the center but stiffened at both ends by the top and bottom walls of the water-jacket.

The problem then is to re-finish a long slender cast-iron pipe, of relatively large diameter as compared with the wall thickness in which we are likely to encounter a highly glazed surface with sometimes a few scores and hard spots to further complicate matters.

Early Methods

Until recently there had been but two principal ways of doing this work. If done by the garage man the bore was usually lapped out with an old or new piston, plenty of emery, oil and elbow grease, the resultant hole being sometimes fairly true but more often not, depending on the skill, muscle and patience of the "lapper." Also, no inconsiderable portion of the lapping compound was likely to be left in the pores of the iron walls, or even in the crankcase, with the result that the lapping continued long after the garage man had reassembled the motor.

The other method was to strap the block on the carriage of an engine lathe and rebore the holes with a single point cutter held in the regular form of boring bar, usually taking out about $\frac{1}{32}$ in. so that the cutter would not ride over the polished surface of the hole. New pistons and rings would then be fitted up in the engine lathe and the job thus be completed.

In regard to this boring method the writer has found that even when using a double-ended cutter in an expanding boring bar, considerable springing away of the cylinder walls results, so that after taking one cut of, say about 0.020 or 0.010 in. per side, another cut could be taken without altering the setting.

These older methods have been rendered practically obsolete by the new modern methods employed; mainly grinding and reaming.

Many varieties of reaming tools are in use. There is the well-known "Critchley" type of reamer, expanding by means of a conical nut at each end of the blade. This type of reamer necessitates a pilot or support to make sure that the tool enters the hole properly and consequently we find various piloting devices incorporated, or else we see the reamer held in the spindle of a drill press or boring mill. A more modern specimen of this type of reamer has a pilot ground directly on to the blades. Then there are a number of so-called reboring tools, comprising a short multi-bladed cutter holder, having a pilot ahead of it usually made in some form of expanding ring and supported behind by a spindle or screw, held in a bracket which bolts to the top of the cylinder block. These tools can be operated by hand, by self-contained electric motor or by connecting to a drill press or boring mill.

Such tools have the advantages of being small, portable and cheap and although probably not as rapid or accurate as a more elaborate machine they have a decided advantage in that they can in many instances perform the work on the cylinder block in place in the car, the cylinder head, pistons and connecting rods being removed, but crankshaft, clutch, etc., being undisturbed.

Still another type of tool which has entered the field later than any of the previous tools mentioned is the expanding reamer which depends on its own blades for piloting. These reamers are usually entered into the hole, expanded to size by some device on top of the reamer and then turned by means of a solid or a ratchet wrench like any other reamer. On reaching the bottom of the hole the blades can be withdrawn and the reamer taken out.

One reamer of this type is suspended by a rope from above, giving the reamer preliminary alignment; this rope passing over pulleys to a counterweight so that the reamer can be left suspended at any point desired. These reamers can be driven as in the case of the reboring tools mentioned either by hand or power and can also be used in the bores in place in the car.

We would say that we have found a properly reamed cylinder bore to be of quite sufficient smoothness for the purpose, as an indicator with spherical point can be run up and down the bore without showing any ridges or hollows of more than 0.00025 to 0.0005 in. variation, and even these minute irregularities disappear after the motor has been run a few hundred miles.

Fit Pistons Closely

In our practice we aim to keep piston clearances within very close limits; thus, if the necessary clearance has been set for any given bore at say 0.003 in., we ream the bore to 0.002 in. clearance and in a very short while the friction of the rings will have taken one-half to one-thousandth from the bore leaving it smooth.

Some fit the pistons even closer than this, leaving hardly any initial clearance but giving the motor a preliminary running-in with plenty of oil and with a stream of cold water flowing through the radiator. This method should result in an almost perfect mating of surfaces and when worn to a fit, the requisite working clearance should have been obtained.

To give one specific example, the writer has seen a block reamed and pistons fitted with about 0.001 in. total clearance. After running about 300 miles the head was removed and examination revealed that the clearance had increased but 0.0005 in., while the working sufaces, though not as yet perfectly mated, were rapidly approaching that state and that probably in the next 300 miles would "reach bottom."

As to the different methods and their relative values, it is as with almost everything else: all good methods and tools have their proper application, there are merits and demerits to all mechanical devices, each finds a field where its good points count and its weak points are not injurious. The working of economic law usually puts men and machines, not forgetting tools, just about where they belong.

Industrial Schools in Springfield, Mass.

SPECIAL CORRESPONDENCE

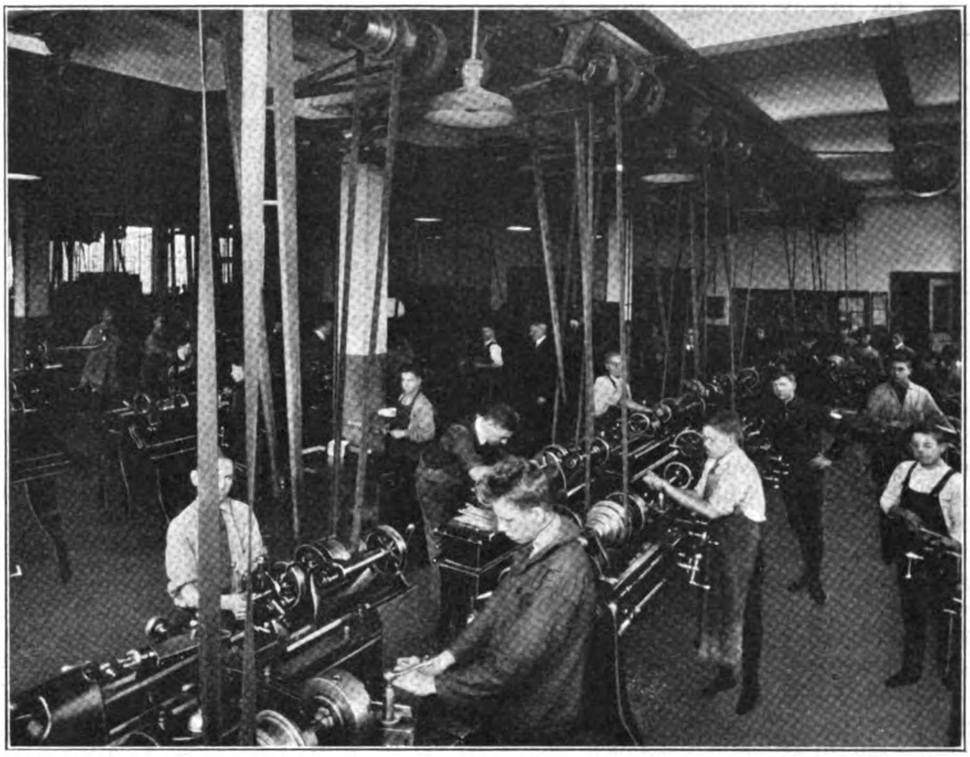
The new building of the Springfield (Mass.) Vocational School, which opened for public inspection soon after New Year's, is gradually installing machinery and equipment to bring its operations to full scope, and will be one of the best-appointed institutions of its kind in the East. The illustration affords a view of the machine shop. Students of the machine shop and woodworking department are engaged in producing needed equipment for the school, and similar service is rendered by the drafting and patternmaking departments, thus enabling the school forces to be employed without competing to any great extent with wage-earners in a slack season for the machinery trades.

Courses have been instituted in machine work, drafting, patternmaking, cabinet making, printing and electrical work, and a course in automotive mechanics will be started soon. Each course requires three years for the average student to complete. Three-fifths of the time is devoted to shop work, one-fifth to subject matter related to that work, and the rest to general academic subjects with an emphasis on the industrial side. Every student must be over fourteen years of age and have finished work of the sixth grade. The enrollment now numbers 230. In addition there are sixty rehabilitation students placed at the school by the Federal Veterans' Bureau.

The work also includes an evening vocational school, with eighty enrolled, mostly adults, this being extension work within the scope of the Smith-Hughes Act. Every evening student is required to pursue some line kindred to his regular work and every instructor in trade subjects must have had eight years' journeyman experience.

G. A. Burridge, principal, and seventeen instructors constitute the regular staff. Department heads are: E. J. Fasser, machinery; James D. Long, drafting; Thomas L. Flynn, patternmaking; H. T. Perry, cabinet-making; John J. Mack, printing; Clayton E. Bliss, electrical work.

Also giving instruction in the trades in Springfield are the Evening School of Trades, at the Technical High School Building, with 500 men and 300 women students, directed by a staff of forty; and the Continuation School, having its own building, with 200 boys and the same number of girls. The Evening School of Trades has recently instituted a three-year course in engineering, with six hours of intensive work each week, in addition to courses in sheet-metal work, woodworking, electricity, automobile repair, plumbing, etc. Industries of that section supply many of the instructors. In the women's classes household arts and science are taught. The Continuation School, with students from fourteen to sixteen years of age, all employed in local establishments, conducts courses in machine shop practice, woodworking, printing, commercial subjects and home economics. This school has a particularly well-equipped machine shop, and original work is sought as one of the important ends in the different departments. The school, now in its first year, and having C. W. Robinson as its director, is working out a comprehensive system of production charts and is also making a detailed survey that is to include every industry in the city.



STUDENTS AT WORK IN THE MACHINE SHOP

These special schools, as adjuncts to the regular grammar and high schools, which also bear extensively on the vocational and technical side, are engaged constructively in the effort to further the work of training skilled industrial workers that shall keep New England in a high place in the machinery and other trades, and because the industries of the Springfield district are so widely diversified the schools possess exceptional opportunities.

How to Compile Catalogs

Objects of Catalogs—Importance of Engineering Data in Selling and After Sale—Shortcomings of Most Catalogs—Constructive Suggestions for Improvements

By ALEX DOWEL

THE purpose of a catalog dealing with mechanical equipment such as machine tools, small tools and the like is twofold. First, to assist in advertising and selling by showing the nature of the product and giving a description. Second, to give sufficient data and prices so that machines or tools can be selected and ordered from the catalog and a check for the proper amount sent.

Attempts have been made by various manufacturers of machine tools to prepare catalogs that will answer both purposes and while such efforts are commendable as showing a realization of catalog shortcomings and while they are undoubted improvements over their predecessors, they leave a considerable amount of room for improvement.

It Is Necessary to Furnish Information

Does it not appear to be a good business principle to consider the whole subject from a broader point of view and try to find out what people who actually use catalogs think about it? After the catalogs are distributed the manufacturer will doubtless say, "Oh, these are our customers, past, present and future; we want to impress them with the value of our product; that is the purpose of the catalog." Would it not be more nearly correct to say that the prospective customer wants first of all INFORMATION? Really, that is the sum and substance of his needs. The manufacturers will say, "We don't want to tell him too much, for if we do he will not ask for more information; if he doesn't ask for more we cannot get closely in touch with him and the first thing we know the Blank Manufacturing Company will send a salesman to him and sell a machine."

If you depend upon your catalog to act as a salesman you will be disappointed no matter how it is prepared. The salesman also is only an item in marketing your product. The eventual reason why you will make the sales is because of the merits of your product. Your catalog helps, your salesman helps, but your reputation and the merit of your product should be of greater help than anything else.

Let us see what factors are most essential in selling a given mechanical product. There are the cost; durability; operation; cost of maintenance, etc. The man to whom you are selling your machine or tool is usually a mechanical man. But if he is not, he is depending upon some one to advise him. By what method does he reach his decision? Probably by the consideration of cost and relative merit. The cost can be readily determined. If the merits of the machines are backed up by a firm name well-known and of good repute, the selection may be made because of that reputation. If the machine is of a new type and made by a comparatively unknown firm, the prospective purchaser must depend largely upon description, specifications and data in the catalog together with any other information which he may receive from the salesman.

Having analyzed to some extent those matters which effect the purchase of the product let us take up a few specific instances of important items which should be included in the catalog: (1) General description, stating the purpose of the machine and the class of work to which it is most suited; (2) details of construction; (3) details of operation; (4) applications to various kinds of work; (5) specifications; (6) selling price.

In the general description considerable latitude is permissible. If the factory has been established a great number of years and is well known it may be of interest to say a few words regarding the organization, its inception and progress over a period of years. Some manufacturers take up these matters at considerable length but I do not believe that it is essential. Following a brief history, the principle uses of the product should be stated; this will make a logical introduction and lead up to matters connected with design and construction.

A general statement can be made as to important points in design and information can be given as to reasons for certain features. Factors, which in the belief of the manufacturer make it superior to other machines of a similar nature, can be explained. These points should be mentioned in a broad way but should not be taken up in great detail. Paragraphs may be included regarding the various types manufactured and the equipment that can be provided. All of these data may be considered in the nature of an introduction and it should therefore not take up much space, normally 500 to 600 words.

Details of Construction

A consistent method requires that descriptions be given, with line cuts or halftone reproductions of important details in design. The opening paragraph should state the range of the machine so that there will be no doubt in regard to its capacity and ability to handle a given class of work. The head and bed, the spindle, the feeds, the gear box, carriage, oiling system and cutting lubricant system should be mentioned briefly, yet with sufficient detail to make all points of interest clear. The customer will naturaly be interested in any points that have to do with upkeep and wearing qualities. Rigidity, accuracy and power should be referred to. The wording should be convincing yet conservative.

Another matter which will always interest any one who is in the market for a machine is the method of handling and convenience of operation. The shop man for instance would wish to know how the various speeds and feeds are obtained and would doubtless decide as to whether or not the levers and handles were conveniently placed. The feed mechanism, the gear box, the various levers, can be briefly described. Great detail would not be required as the operator's hand book would give all necessary information regarding setting up.

It is always of interest to show applications of machine tools to various kinds of work for which they are particularly adapted. Often a customer will be influenced to buy machines and tools if he is shown the application to work of various kinds. Considerable

variety in the examples given will not only illustrate specific cases but will make the flexibility of the machine apparent. On certain types of machine tools that require considerable tool equipment, such as turret lathes and the like, the data presented will be of particular interest to the shop man and the engineering department. Therefore, if the examples given are selected with a view to showing the adaptability of the machine to a wide range of conditions there is much more likelihood of a sale. If the examples shown are drawn in detail with dimensions and production figures, an impression of the greatest value is made on the prospective customer as it places before him several concrete examples of machining operations together with the length of time necessary to do the work. A comparison of the production time with the time on similar work being machined in his own factory may affect the situation strongly enough to create a desire to possess one or more of the machines. Several manufacturers of machine tools have shown detail drawings of various parts giving production time on each but they have not in the majority of cases shown the methods of tooling which are applied to each case. The writer believes that it is important to show how the results were obtained. The amount of space available for these details depends upon the size of the catalog, but it is usually possible to devote three or four pages of a catalog of normal size to them.

SPECIFICATIONS

Machine tools are built in various sizes and with different capacities. A table can be arranged to include complete specifications regarding sizes, capacities, speeds, feeds and all other data necessary when planning production work. The present lack of information is regrettable. There is hardly a catalog that will give all the information necessary to enable a tool engineer to design fixtures or special tools for the machine described. If the preparation of the specification table should be turned over to the engineering department with a request that it confer with the tool department to make sure that all important dimensions are included, a long stride in the right direction would have been taken.

It should not be necessary for the tool designer to go out into the shop and measure up a machine, yet in the majority of cases such a procedure is required.

In addition to the actual specifications, it may be necessary when special tools are to be fitted to various parts of the machine to include a certain amount of special engineering information in diagram form with dimensions. The spindle for example should be shown in section with all necessary dimensions so that a chuck or faceplate can be properly proportioned. So also the turret and cross-slide on a turret lathe should be given in detail. On milling machines the table dimensions and distances between T-slots as well as the dimensions of the slots themselves should be specified. When standard tools, such as turning or boring tools, are furnished as a part of the equipment, their capacities should be stated in the table. One of the best ways of realizing the amount of data required in a catalog is to put yourself in the place of the man who would be required to design tools for use on the machines described.

When preparing catalogs of small tools there are several points of importance. Some have been mentioned previously but there are a few that have not been taken up. Considering a small tool catalog as a whole, if the manufacturer has specialized along a certain line for a number of years, it would be wise to include as an introduction a brief historical chapter. If several kinds of small tools are made it would seem advisable to include a statement to that effect. General instructions can also be given in the introductory chapters regarding the ordering of tools as can any other data that seem pertinent. The classification of small tools is an important factor for the preparation of a catalog and it is a good idea to group the tools according to some well-defined system. If the catalog is a large one the sections can be divided by sheets of paper of a different color or they can be thumb-indexed. A complete index of all tools listed should be conveniently placed, preferably at the back of the catalog.

A great many small tools are held in bushings or by means of holders. For example a straight shank chucking reamer of small diameter is frequently held in a bushing by means of a setscrew or placed in a floating reamer holder. Whichever method is used it is necessary to know the diameter of the shank. This dimension is usually lacking in small tool catalogs so that when making up holders the reamer shank must be measured. If the reamer should happen to be in stock that might not cause difficulty, but if ordered from outside, as frequently happens, the equipment could not be completed until after the reamer had been received. The same thing applies to straight shank taps and arbors for shell reamers. In fact, it is almost invariably the case that the dimension required for fitting a tool to a holder or bushing is left out of the catalog when it could just as well be included.

There does not seem to be any consistency in the manufacturers' attitudes in respect to giving dimensions. A combination drill and countersink for example is usually held in a drill chuck and the diameter of the body is not particularly important, yet it is given.

GENERAL INFORMATION

There are frequent cases where small tools are listed and the description that goes with them is not complete enough to give a prospective purchaser sufficient information as to their use. The application of the tool to the work can often be shown by means of a line drawing or a sectional view, thus making the subject matter clearer and enabling the purchaser to analyze his own problem and decide whether a given tool is suited to it or not. I would hardly go so far as to suggest that all tools listed in a small tool catalog should be shown by line drawings but at the same time I venture to state such a procedure would meet with the approval of the entire engineering fraternity. It would be interesting to prepare a catalog of this sort and send it out with a questionnaire for comments as to its utility from both an engineering and sales point of view. It is possible that there may be a happy medium between a catalog containing all half-tones and one containing all line drawings with necessary dimensions.

Speaking broadly I believe that catalogs of mechanical equipment are decidedly in need of improvement. Many things are done year after year that simply follow a precedent established perhaps thirty or forty years ago. The illustrations used are more or less up to date and the art work may be exceptionally good. However, the man who is using a catalog to obtain information prefers finding it to looking at the art work. Appearance should not by any means be neglected though; it would seem that a judicious combination of art and needed information would result in improvement that would be much appreciated by the mechanical fraternity.

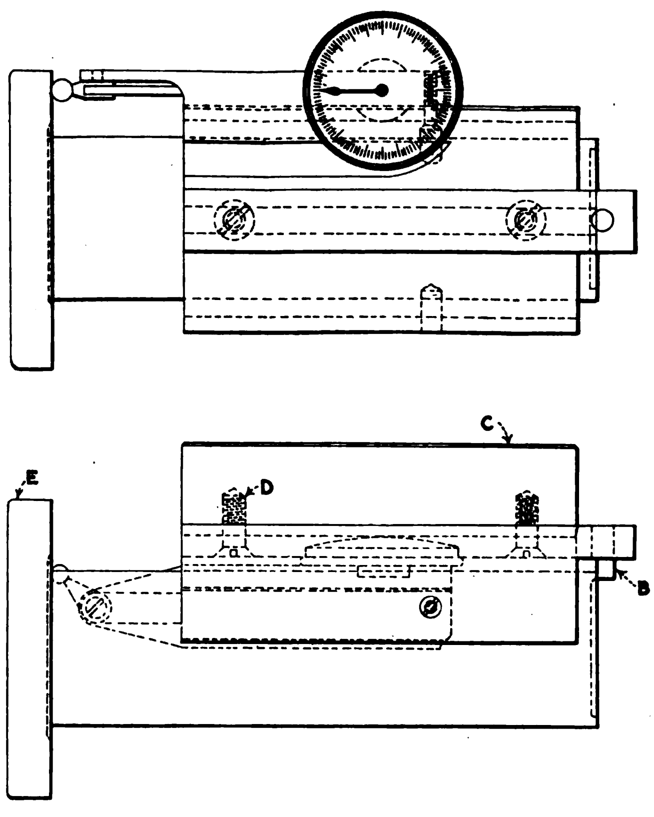
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

An Indicating Length Gage

By Osbert E. Charles

The accompanying sketch shows one of three indicating length gages that I made, and which have worked out very well for use in grinding shoulders of various shafts to a limit of 0.0005 in. The dial indicator used is a "Last Word" which is mounted on a hardened and ground V-block *A*. In the back end of block there is a hardened pin *B*, the front of which has a flat about $\frac{1}{16}$ in. wide ground on it after the pin is in position, and which comes in contact with the shoulder of the work. The dial indicator is positioned on block *A*, so that the registering point will have a movement of about 0.015 in. on the dial. A piece of cold-drawn steel *C*, $\frac{3}{8}$ x $\frac{1}{2}$ in. with finger grooves milled on each side is fastened to the top of block *A* with two flat-head screws *D*, making a convenient handle for the gage. In order to check the accuracy of the gage a set block or dummy *E* was made to the correct length, and the length marked on it to prevent any chance of error. After the indicator has been properly adjusted, a drop of solder should be put on the pivot of the adjustable contact point to guard against a possible slipping of the friction adjustment.



INDICATING LENGTH GAGE

By using this gage it is possible to gage the work without removing it from the centers and, working it in conjunction with a micrometer stop on the table of the grinding machine, we have been enabled to make considerable saving of time as the operator knows just how much he has to take off and sets his stop accordingly. It is very seldom that he takes more than two readings, one when he starts and one to check himself before removing the work from the centers to put in a new piece.

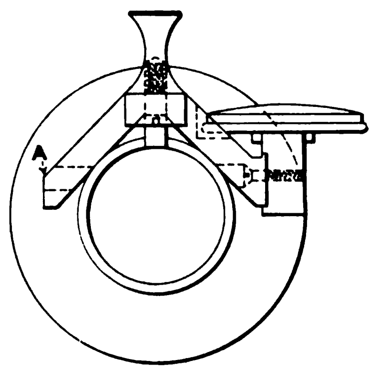
Attaching a Wire Rope to a Socket

By Martin McLauthlin

On page 309 of American Machinist, is an article headed "Attaching a Wire Rope to a Socket," in which the opening statement carries the implication that if the cable is attached to the socket in the manner described the connection may be depended upon to develop the full strength of the cable.

In my experience of over thirty years in the use of wire rope fastenings for passenger and heavy freight elevator service, I have become familiar with and have made many tests of various types of cable fastenings and I have found that the fastening described does not merit the confidence it sometimes receives, even when made by men accustomed to it, and it is less reliable when made by amateurs.

Muriatic acid is not a desirable associate for wire cable; often the wires are not properly cleansed of the acid and sometimes the cable is so dipped as to permit acid to be absorbed by the hemp core, in which case "rotting" of the cable speedily follows. Sometimes lead or low-grade babbitt is used instead of zinc and it is not unusual for this fastening to fail by the pulling out of a considerable proportion of the wires under a stress much below the ultimate strength of the cable. In the preparation of the A. S. M. E. "Safety Code for Elevators" very much consideration was given to the matter of suitable cable fastenings and the type of fastening described in your article is not recognized by that code.



I have thus far found but one fastening which insures "that the full strength of the cable may be depended upon," namely, the spliced eye; and that is so logical, simple and reliable that it seems unusual that it is not in universal use. If the simple instructions given in the A. S. M. E. Elevator Code are followed, it is more difficult to produce a spliced eye that will develop less than 100 per cent of the cable strength, than it is with equal care to produce with a "fan hitch," as

your article describes, a near approach to the cable strength; and the "fan hitch" will, if not thoroughly cleansed of acid, deteriorate rapidly with age.

Following are the A. S. M. E. Elevator Code instructions for making a spliced eye:

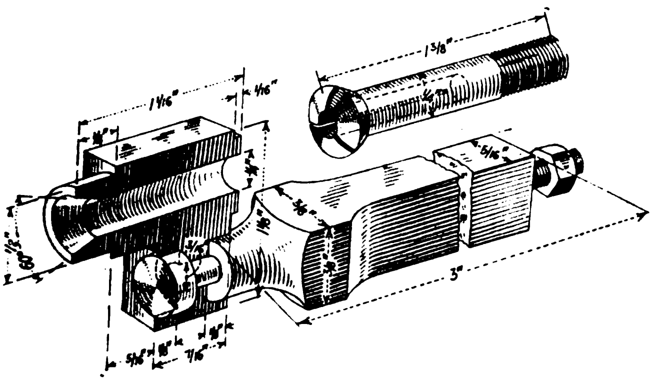
"A metal thimble shall be placed within the eye and the splice made with not less than the following number of tucks: First strand, two tucks; second strand, three tucks; third strand, four tucks; remainder of strands, five tucks. The eye shall be drawn tightly around the thimble, the strands drawn tightly after each tuck and the tuck smoothly laid. After the last tuck is made each strand shall be cut off not closer than one-fourth ($\frac{1}{4}$) inch from the tuck and beaten down flush. The splice may be left bare or served with marline."

Boring-Tool Holder for the Bench Lathe

By Frank H. Baker

The accompanying sketch shows a boring-tool holder that I have found very convenient for use in the bench lathe.

In the shop where I am employed as toolmaker the product is dental tools, and my work consists principally



BORING-TOOL HOLDER FOR BENCH LATHE

in making small dies, jigs and fixtures. I find this holder to be invaluable for holding tools for boring small holes down to $\frac{1}{16}$ in. in diameter.

The parts may all be made of machinery steel and pack hardened, except the spring collet. The swinging feature renders the tool quickly adjustable for height.

Pin Wrenches for Any Size Nut

By I. B. Rich

Nuts and screw connections which require a pin wrench are rather hard on repair men, as the holes are never alike in any two cases and none of us have a large variety of pin wrenches lying around loose. It usually happens that in the nut which you must take off or put on, the diameter of the holes and their distance between centers differ from the pins on any wrench you have.

I had such a case the other day and, as usual, the man was in a hurry. He'd just had one flivver stolen and he bought a new locking wheel to have put on his new car before someone took that one away from him. This wheel had a nut which needed a pin wrench different from any I had. I was just starting to make a wrench in the usual way when a bright idea dawned upon me.

The bright idea was to bend up a staple as shown at *A*, Fig. 1, using the right size wire to suit the holes in the nut. Then I clamped the staple in the hand vise shown

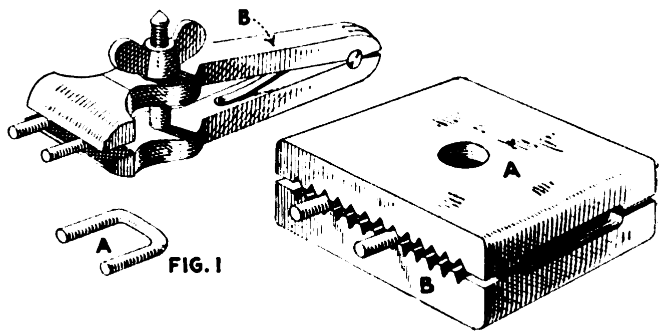


FIG. 1. AN IMPROVISED PIN WRENCH. FIG. 2. A WRENCH FOR VARIOUS SIZES

at *B* and I had a wrench which did the trick by using a wrench on the vise for the final pull. It's an easy matter to bend up a few staples and have them handy for other jobs.

When I get time I'm going to make a real, universal pin wrench as shown in Fig. 2. I'll have two plates like *A* with raised edges *B*. One edge in each plate will have V-notches, spaced as closely as convenient. Then I shall make up several sizes of pins, in sets of two from drill rods, and magnetize the pins so they will stick whenever I lay them in the holder. This will prevent the pins falling out and rolling under the bench while I am setting them for different center distances. With this combination in my tool kit, any old size of pin-wrench nut will be easy picking and there will be no delays to customers.

Enlarging Pistons by Plating Them —Discussion

By H. Clinton

Regarding enlarging pistons by plating, as told in an article on page 287 of American Machinist, I would say that about eighteen years ago I was in charge of some Lanston monotype keyboards and when overhauling a lot of these which had seen considerable service, we discovered that the fits of the pistons which actuated the perforating punches had become so loose that there was quite a loss of power, as well as considerable waste of compressed air through leakage around the pistons.

Careful inspection disclosed the fact that the holes in which the pistons fitted were both bell-mouthed and out of round. As it meant a delay of about three weeks and the expense of purchasing new parts if we relied on the factory to help us out, I decided to re-ream the holes with an expansion reamer until they were round and straight, and nickel-plate the pistons. As the pistons were of brass, copper plating was omitted. The plating was done very slowly on the theory that we would get a fine-grained and dense deposit.

In order to get a variation in size some were left in the bath longer than others, thus enabling us to make selected fits. This procedure worked out surprisingly well. We were able to get the machines in excellent running order in a short time and had no further trouble with them so far as the pistons were concerned.

Special Screw for Securing Strippers to Dies

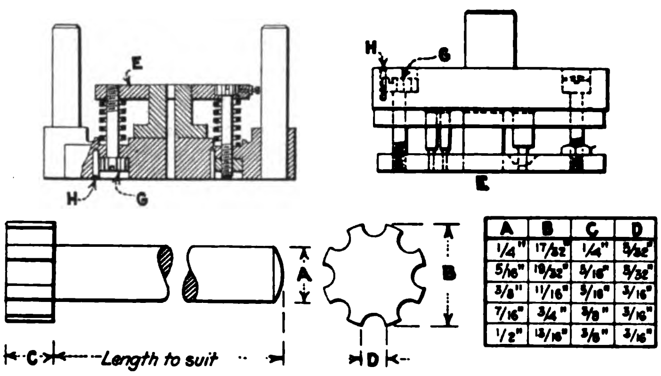
BY DONATO ZAZZARA

The method of holding strippers for sub-press and blanking dies, blankholders, etc., herewith illustrated and described, is simple in construction and satisfactory in use.

In the illustration of a sub-press die and a piercing punch the reader will note a comparison of the method with that more commonly used; the new to the left, the old to the right.

The stripper *E* is tapped for the holding screw *G*, which has a special head with eight shallow grooves equally spaced about the circumference. After the proper position of the stripper is determined, the small setscrew *H* is inserted in the die bottom, one half fitting a groove in the head of the holding screw. This keys the holding screw securely to the die bottom, with no possibility of its turning, so that the original position of the stripper is maintained regardless of how much pounding the die receives.

A distinctive feature of this construction is that it offers a means of adjusting the location of the stripper accurately and quickly. By removing each setscrew and turning each holding screw an equal number of grooves,



A	B	C	D
1/4"	17/32"	1/4"	5/32"
5/16"	19/32"	5/16"	5/32"
3/8"	11/16"	5/16"	3/16"
7/16"	3/4"	3/8"	3/16"
1/2"	13/16"	3/8"	3/16"

SIMPLE AND SATISFACTORY METHOD OF HOLDING SCREWS IN STRIPPERS

one may be certain the relative position of the stripper is correct. Practice will soon teach the proper amount of rotating to give the holding screws in order to obtain any desired adjustment of the stripper.

Comparison of this simple means with the ordinary method shows two parts against five. With the old method constant vibration often loosens the locknuts and allows the stripper to become displaced, sometimes with disastrous results.

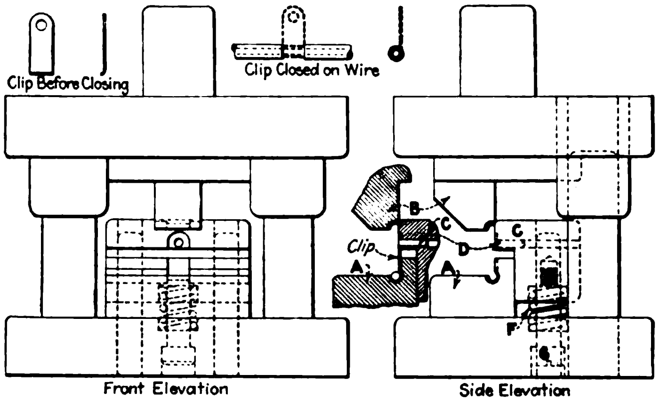
Should the reader decide to adopt this plan, details of the special screws are shown which have been proved to be well adapted to the purpose.

Unique Clip Rolling Die

BY EDWARD H. TINGLEY

The Delco-Light Co., Dayton, Ohio, has developed and is successfully using a clip rolling die to close a brass clip around a stripped electrical wire, preparatory to soldering. The clip, of 0.031-in. sheet brass, is blanked, partly formed and the end curled to a quarter circle before going to the rolling die. The wire around which the clip is rolled is first stripped of the insulation at the places where it is desired to have clips, and after assembling, the joint is soldered to make a tight electrical connection.

The sketch shows the construction of the die. The



TOOLS FOR ROLLING CLIP ON WIRE

lower forming block *A* and the upper setting block *B* are both recessed to the proper diameters to care for both the insulated wire and, at the working part of the die, the clip and bare wire. Block *A* and the sliding receiver *C* are both recessed to hold the clip, to a depth no greater than the maximum thickness of the sheet brass of which it is made. *D* is the locating and supporting pin that fits in the hole of the clip.

The clip is placed on the pin *D* and in the recess of block *C*. The wire is laid in the block *A* at the proper place. The upper setting block *B* descends, holding the clip in the recess in *C* until *B* hits the top of *C* when both *B* and *C* move downward against the tension of spring *F* and start to curl the clip around the wire. Further downward motion brings *B* in contact with *A*, when the clip receives its final set.

On the return stroke the blocks *B* and *C* and the wire and clip all rise together until the screw *G* holds the block *C* from going any higher. Block *B* continues to rise to the end of the stroke of the press. Clip and wire are then free to be removed.

This die is designed to be used on a No. 19 Bliss inclinable press. The incline serves to hold the clip on the pin until the die descends. Excellent results have been obtained with this die as the clip comes out perfectly flat.

Height-Gage Lines

BY GUSTAVE A. REMACLE

The modern height gage is a very serviceable instrument and the degree of accuracy which can be attained when working directly to lines scribed by it depends largely upon two things—the workman's skill as a mechanic and his knowledge of the form of a height gage line.

It seems to be a general habit to regard a height-gage line as merely a line, light or heavy, straight and accurately laid off. However, owing to the peculiar form of these lines, their width and lack of uniformity of width affects the accuracy with which points may be marked off in relation to certain other definite points.

In Fig. 1, I have sketched a magnified cross-section view of a height-gage line together with a prick punch ready to strike off a center in the wrong place. Before the peculiar structure of such a line occurred to me, I had often noticed that when I had bored a number of

holes, by means of wiggling from prick punch marks, I succeeded in obtaining the desired positions of the holes in relation to each other, while a few thousandths of error existed in relation to the original striking-off point which would usually be the top or bottom of the piece, or some projection.

In the accompanying sketch, *A* represents a line which should be the center of a hole to be bored. If a line has been laid off which is 0.004 in. in width, it can be plainly seen that error is bound to result even though the greatest care is observed with other operations.

Owing to the form of a height-gage needle, this error cannot be removed entirely but it can be reduced to a minimum by having the needle sharp and by marking off light and uniform lines.

When a prick punch mark is to be made at the intersection of lines, the accurately ground prick punch should be placed gently into one of the lines and then moved along until the point rides into the intersection. A very slight click can be felt when this happens. Before striking the prick punch with a hammer, the prick punch should be held in a vertical position and pressed downward by hand. This will produce a tiny mark

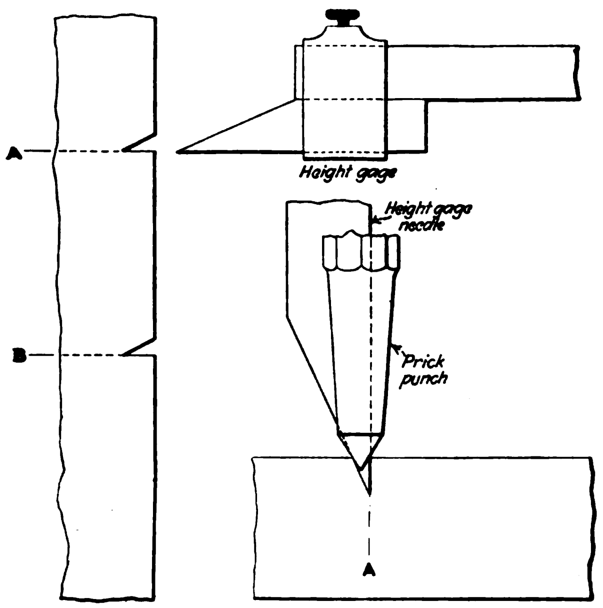


FIG. 2 FIG. 1

FIGS. 1 AND 2. MAGNIFIED HEIGHT-GAGE LINES

which can be observed with a magnifying glass. If this mark appears to be accurately made, the punch can then be placed in position and tapped with a hammer.

Another manner in which toolmakers work directly to height-gage lines consists of making an outline with height gage, scriber, dividers and trammel points and then working to the lines. This method is much practiced in the die-casting game. Here again if these various lines are regarded merely as lines, error will occur in accordance with the width of the lines.

In Fig. 2 I have shown a magnified cross section view of lines which have been marked off from some other point of the work with a height gage. It is essential that a depression be milled between points *A* and *B*. The reader can see at a glance that if accuracy be desired, line *B* should be entirely milled away while in the case of line *A*, the cutter should be worked in until it just grazes the line, removing none of it.

Scriber, divider, and trammel points each make lines peculiar to themselves and if error is to be minimized these instruments should be kept sharp and light lines should be made. Also, when working to the line the cross section form of the scribing point should be kept in mind. When I strike off lines with the height gage, I often mark that part of the die plate which is up during this proceeding because it would be a difficult matter to determine which lines should be milled away, and vice versa, after once the work is set up.

A Simple Cylinder Grinding Rig for a Lathe

By Charles Brown

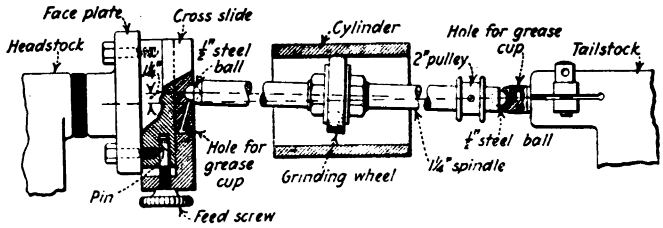
The writer has found the device, herewith illustrated and described, to be very useful in his small shop for the purpose of grinding out automobile and other cylinders. While he does not attempt to compare it with any of the standard cylinder grinding machines on the market in quantity of output, he believes it to be about the limit of simplicity and low cost of construction for such shops as cannot afford to have one of the standard machines.

An arbor of suitable diameter and length to handle the work required of the device, is cupped at each end to take a standard ½-in. bearing ball. A 2-in. flanged pulley is pinned to the arbor quite near to one end and, at the middle of the arbor, right- and left-hand collar nuts are fitted to hold a suitable grinding wheel between them.

The arbor is supported in the lathe by a cupped center at the tailstock end and at the other end by a block having a similar cup on its outer face and fitted to slide radially in a suitable piece that is bolted to the faceplate. By means of a knurled adjusting screw the bearing block can thus be moved in or out from the center and thereby change the radius of the circle described by the gyrating wheel.

As the driven pulley is so near to the fixed tail center the "drunken" motion is not sufficient to seriously affect the somewhat long driving belt, which comes from an auxiliary counter overhead. The arbor runs 6,500 r.p.m., and the maximum amount of offset obtainable at the faceplate end is 1¼ in., giving a scope of adjustment at the wheel of approximately ⅝ in. These dimensions can, of course, be made to meet expected requirements. With this device I have enlarged by 0.012 in. the bore of a cylinder 3¾ in. long in 19½ minutes.

[Though our correspondent does not say so, it would seem necessary to redress the periphery of the grinding wheel after each increment of setting, as the corner of the wheel nearest the faceplate would, of course, advance faster than the opposite corner and thus alter the



INTERNAL GRINDING RIG FOR LATHE

bearing of the wheel upon the work. Also there would seem to be need of compensating for the changing distance between centers as the adjusting block was moved along its slide.—Editor.]

EDITORIALS

Dangerous Economy

CONGRESS has succumbed to another violent attack of economy. Not content with the excellent achievements of our negotiators at the Disarmament Conference, it has threatened to undo most of the work done there by cutting the Navy personnel from Secretary Denby's conservative estimate of 90,000 men to 65,000. To maintain the 5-5-3 ratio to the full, would require 130,000 men.

No business man will find fault with a genuine effort on the part of anyone connected with the Government of the United States to effect economies in the operation of government functions. On the contrary he has used every means in his power to urge such economy. But the present movement to scuttle the Navy by reducing its personnel below the point at which it is barely possible to maintain efficiency, is neither sincere nor an economy in the long run.

Look at what happened to the Rivers and Harbors Bill—increased by $15,000,000. An increase in almost any other appropriation would not be such conclusive evidence of the workings of the politician's mind, but the manipulation of these particular funds has long been infamous. We venture to predict that the usual $350,000 for free seeds will get back into the appropriation bill before it reaches the President. No other proof of the lack of sincerity is needed. There is an election next fall.

But what of the ultimate effect of such a reduction in the Navy? Have the American people forgotten so soon how long it took and what it cost to get our unprepared Navy into action? It was not an achievement to which many of us care to "point with pride." A few millions spent before 1917 in maintaining the efficiency of the Navy would have saved many millions spent later in trying to make up the lost ground. Any machine deteriorates rapidly when maintenance is neglected.

The AMERICAN MACHINIST has supported the position taken by the United States in calling together the Disarmament Conference and in making the tremendous sacrifice which alone made the negotiations successful. That sacrifice was necessary to prove the good faith of this country in its plea for reduction of naval armament, and was only made on condition that corresponding sacrifices, even though smaller in size, were also made by England and Japan. It was a business-like compromise in which each party gave up something for the benefit of all. The reduction of the Navy personnel is nothing of the sort, it is simply a wild, regardless-of-consequence slash at appropriations so that the candidates can go before their constituencies with a record of reduced expenditures at which to point.

We feel confident that we voice the opinion of the machinery industry when we say that we fervently hope that this country will never be engaged in another war, but we are equally confident that the industry does not believe that the way to peace lies in the disarmament of the United States while other nations maintain their military establishments. We hope that this country can and will call other conferences looking to further limitations of armament, and eventually to universal peace, through universal confidence and understanding, but we do not believe that much can be accomplished by a big and wealthy nation without means to defend itself. Human nature doesn't work that way.

No doubt you will agree with what we have just said; most thoughtful Americans will, but your opinion will have little effect unless your representative knows what it is. Tell him.

How the Buyer of Machine Tools Increases the Sales Price

ANY general manager will admit that the cost factor hardest to figure is the cost of sales. He can easily get accurate figures on production costs up to the time the machine is ready to ship—but the cost of getting the order is almost an unknown quantity. It varies from almost zero, when the customer writes or wires the order without solicitation, to as much as 50 or 60 per cent of the selling price when the sale requires special treatment and much expense in travel.

The buyer, in other words, largely determines the price by the cost to which he subjects the maker in making the sale. If the buyer makes it necessary for the seller to make several long trips, if he delays him unnecessarily, if he subjects him to expense in any way, the buyer in the end pays the bill. There is no other way. Every cantankerous buyer who boasts that he is a hard man to sell, is adding to the cost of machines bought by himself and everyone else.

We must also get over the notion that the buyer is conferring an everlasting favor on the seller. It is frequently the other way around. In the case of machine tools the buyer secures a machine which he uses indefinitely to produce a profit for himself. Is not the favor on the other side, if at all?

Whatever the sale, each side should benefit. If the seller did not prefer the money to the machine he would not sell. If the buyer did not prefer the machine to the money he would not buy. And whatever adds to the cost of making the sale hurts the buyer more than the seller, for in the long run the cost must go into the price of the machine.

Use One-Way Tolerances Only

WE HAVE been thinking of plus or minus tolerances for so long that many do not seem to realize they belong to the dark ages of interchangeable manufacture.

The advantages of the one-way tolerances are many. With holes or all similar surfaces made basic, *plus* the given tolerance, and all plugs and similar mating surfaces made basic, *minus* the tolerance, much confusion is avoided and mechanical operations are made more simple.

The standard hole, with the basic size of the mating

part enough smaller to allow the necessary clearance for lubrication or for other reasons, is now the basis of most interchangeable machine manufacturing.

Both the Newall system in England and the Johansson system in Sweden are based on two-way, or plus or minus, tolerances. Ludwig Loewe & Co. in Germany also used the two-way, or bi-lateral system, for twenty years. But the advantages of the one-way system were so great that, despite the cost and other difficulties in the way, they have now adopted the one-way system.

Similar action is being taken in France and Switzerland and, with the progressive firms in the United States working along the same line, it looks as though the one-way method of tolerances would soon be standard the world over.

Get into the habit of thinking of one-way tolerances only. See that drawings and blue prints are properly marked and help along the good work.

Which Kind of Ton?

THE American Institute of Weights and Measures is now advocating that in all references to tons, short ton or long ton be specified. In America there is little reference to the long ton, frequent reference to the short ton. The obvious way to designate the short ton of 2,000 lb., is the way suggested by the institute, namely, to use nothing but the word "ton." The long ton of 2,240 lb. could then be designated by the word "L-ton."

The AMERICAN MACHINIST has approved the suggestion and will from now on, whenever referring to the long ton, use the expression "L-ton." The short ton will be designated by the word ton without any modification.

It is further suggested by the institute that if circumstances demand it, a ton of 2,000 lb. could be designated by "S-ton." This is especially recommended in trade with Great Britain and its colonies. It seems that such a recommendation is sound and should be followed in dealing with foreign countries using the ton of 2,240 pounds.

False Economy

TO a certain class of buyer the appeal of the second-hand machine is irresistible. The saving of twenty-five or thirty per cent of the cost of a new one is too much for his bargain counter mentality to resist and he falls for a purchase, the value of which is at least open to question.

These remarks are in no sense disparaging to the small shop proprietor who cannot scrape money enough together to buy new equipment, nor to the reputable concerns which render a real service to men of his type by selling re-conditioned machines of standard make with complete equipment. Such dealers are in business to stay and their dealings are entirely legitimate.

Unfortunately, there are others in the machinery business whose principles are not so praiseworthy. How they cheat the unsophisticated buyer is indicated by an article in the last issue of the organ of the British Machine Tool Makers' Association. Special shell lathes, some with but one spindle speed, others without power feed, still others equipped only for special jobs, are catalogued as standard models by shyster dealers.

Here is but one instance of dishonest methods, but it should be sufficient to show the danger for the unwary that lurks in buying from unknown dealers in "as is" equipment. Is it worth the money to pass up the service that goes with a new machine, or a guaranteed re-built one, the assurance that the machine is perfect and the unquestionably better performance it will give, for such a risk?

The Reward of the Kicker

IT IS unfortunate, but true, that many of the favors in this world go to those who make the loudest noise. The pleasant average citizen who doesn't complain if his eggs are ancient or his meat is underdone or his apple pie is forgotten and who treats the waiter as though he were a human being, usually waits for his service until the loud-voiced complainer who finds fault with everything in sight has been pacified. Of course it isn't right, but that's the way it happens.

In other words, if you want service you very often have to ask for it or even demand it, particularly if the service is to come from a municipal, state or federal organization. Some such situation is likely to face the machinery men of the country before long, as the result of the curtailment of the requested appropriation for the Bureau of Foreign and Domestic Commerce. We commented last week on the favorable significance of the fact that an increase, small though it was, had been granted to the Department of Commerce by Congress. It was a well-earned recognition of valuable service.

However, because the increased appropriation for the bureau is still too small for its requirements, there may have to be a revision of plans by the director. In case of such a revision somebody's service is going to suffer and if events follow their usual course, that somebody will be the quiet, deserving group which fails to make its needs known.

That the Bureau of Foreign and Domestic Commerce through its Industrial Machinery Division has been a valuable aid to American machinery manufacturers and merchants since its inception, has been amply proved. What it may do in the future has hardly been imagined, let alone planned, as yet. Foreign trade bids fair to be the next great line of development for the activities of the United States and the men of the machine industry should be foremost in the advance.

Under the circumstances it will do no harm and may do much good, to let the director of the bureau know that you value the work of the division assigned to you and want its work continued and expanded.

Saving the Air Mail

NOW that the Senate has restored the appropriation for a continuation of the Air Mail Service, it is up to the House of Representatives to acquiesce as they have done on several previous occasions. The amount of the appropriation, $1,900,000, is inadequate; but we will be thankful for that because so much of our future in commercial aviation depends on it.

Transportation, perhaps more than anything else, affects all business dealings. Commercial aviation will play a much more important part in future development than many realize. Anything which can legitimately be done to further it should have our unqualified support.

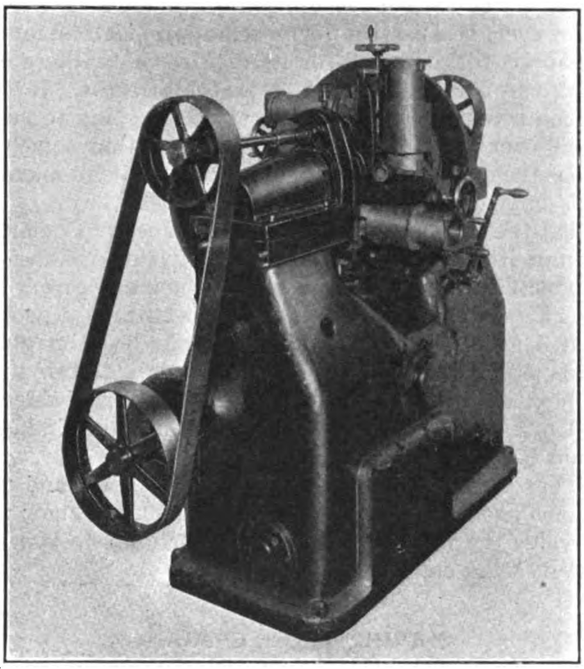
It is hoped that the House of Representatives will agree to this appropriation without further delay. If they do not, it behooves us all to see that our representatives are made acquainted with our belief in the need of this, in a positive manner. The Air Mail must continue and with it a development of suitable commercial planes.

Shop Equipment News

Manufacturers' Consulting Engineers Two-Way Boring Machine

The machine shown in the accompanying illustration is intended for boring simultaneously both sides of the work. It has recently been placed on the market by the Manufacturers' Consulting Engineers, McCarthy Building, Syracuse, N. Y. It is intended especially for boring, bottoming, and reaming both the exhaust and the intake ports of gas-engine cylinders, although the same type of machine is applicable to many similar operations.

The machine is motor driven, and is semi-automatic in operation. The workholder to which the cylinder blocks are clamped accommodates four cylinders, and is arranged to rotate about its central axis. The multiple heads at the two ends of the machine are fed toward the center simultaneously, where they finish the work and then return to their outer positions and come to rest. In this way, the ports on both sides of the cylinder are finished at the same setting.



MANUFACTURERS' CONSULTING ENGINEERS TWO-WAY BORING MACHINE

The workholder is then indexed to the next position, and the feed for the heads engaged by a hand lever so that the cycle is repeated. Loading and unloading of the work is done while the machine is in operation, so that the only idle time of the machine is that required to move the workholder from one position to the other. The machine is capable of machining the castings as fast as the operator can supply them.

The cycle of operations requires 20 sec., in which time one cylinder block is completely bored, bottomed, and reamed on two sides. Two holes $1\frac{3}{16}$ in. in diameter and 1 in. deep are held to 0.001 in. limits in diameter and plus or minus 0.005 in. in depth.

Van Norman Re-li-o No. 2 Bench Wet Grinding Machine

The Van Norman Machine Tool Co., Springfield, Mass., has recently adapted its "Re-li-o" bench grinding machine, such as described on page 776, Vol. 55, of AMERICAN MACHINIST, to wet grinding. The machine is thus suitable for the use of cylinder regrinding shops and piston distributors, where rapid production on a semi-manufacturing basis is necessary. Oversized pistons can be reduced quickly to fit the diameter of re-ground cylinders.

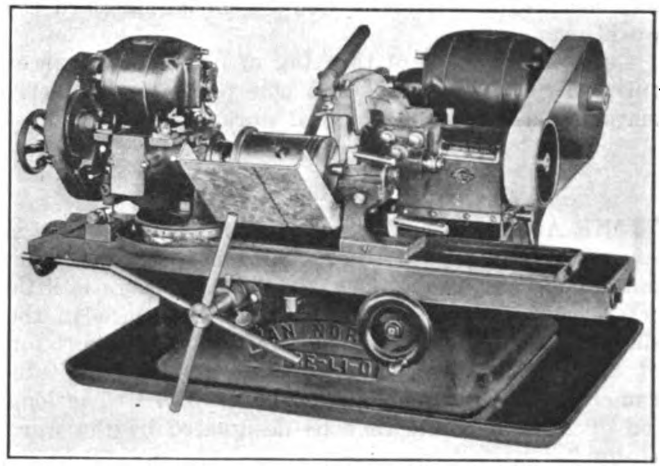


FIG. 1. RE-LI-O NO. 2 WET GRINDING MACHINE

In Fig. 1 can be seen a front view of the machine equipped with a water guard. A pump, tank, guards and piping for flood lubrication are provided. The location and the method of drive of the pump are well shown in Fig. 2. The wheelhead is equipped with a $\frac{1}{2}$-hp. electric motor carrying an 8 x $\frac{3}{4}$-in. abrasive wheel. The wheel slide is made longer than in the dry type of machine, so as to insure greater rigidity.

The tool-holder mounted on the front of the wheel-

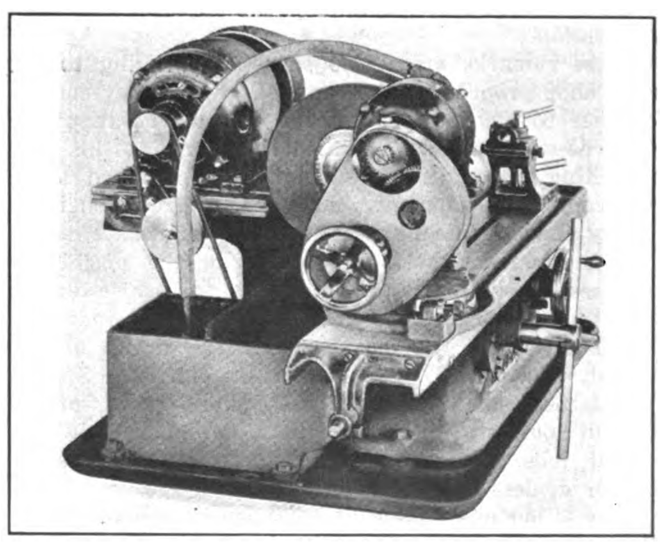


FIG. 2. WORK HEAD END OF RE-LI-O NO. 2 WET GRINDING MACHINE

slide can be swung into and out of the operating position without changing the position of the set-up or dismounting the grinding wheel. It is thus possible to remove a considerable amount of metal from the work by means of the turning tool, and then to swing the tool out of position and finish the work by means of the grinding wheel. The piston can thus be brought to size quickly without distorting it. The work is ordinarily held on a bull center or on an adapter, and the tailstock center is used as an additional support. The wheel is not rotated while the lathe tool is cutting. The toolholder can be entirely removed if it is not needed.

The machine is made heavier in some parts than the dry grinding machine. It has a more substantial locating and clamping device for use when turning the work spindle at an angle, or in securing it parallel to the ways. An adjustable stop is provided to maintain the proper position of the table.

The machine is adapted also to the grinding of wristpins, valves, reamers, and such small work requiring either cylindrical or taper turning operations. It is adaptable also to use in toolrooms and experimental shops. Its net weight is 600 pounds.

Union Portable Universal Saw Bench

In the illustration is shown a small, portable, universal saw bench that has recently been placed on the market by the Union Machine Co., Grand Rapids, Mich. The machine is adapted to use in pattern and woodworking shops, and is capable of handling stock up to 2 in. in thickness. It can be mounted on a bench, although it is ordinarily furnished on the base, as shown.

The base is provided with rollers, one of which is so controlled by the operating handle that it can be raised and the two legs of the base rested directly on the floor. The device can thus be very easily moved from one location to another. It derives current from a lighting circuit, so that it can be connected to a convenient socket. A $\frac{1}{2}$-hp. motor drives the 7-in. saw.

The frame of the machine is a one-piece casting. The table is cast iron, 20 x 18 in. in size, and can be tilted to any angle up to 45 deg. and locked in place. Graduations are provided to facilitate the setting. The bolt connecting the motor and the saw is covered by a guard, and a device is provided for varying the belt tension. The saw may be furnished for either ripping, cross cutting, or combination work. The position of the guard covering it is adjustable, so as to provide room for the desired thickness of stock to be cut.

The arbor of the saw runs in ball bearings at a speed of 5,000 r.p.m. The arbor yoke is hinged, so that it can be raised and lowered to permit the saw to project above the table only the desired amount for the job being performed. Dado heads up to $\frac{5}{8}$ in. wide and of 6-in. diameter can be carried. The metal throat plate is removable, so that hardwood throat plates may be inserted when using dado or grooving heads.

The cross-cut gage can be used on either side of the saw in the two slots in the table. It can be set and clamped at any angle. The ripping gage is machined on both sides and can be used on either side of the saw. It is locked in position and lined up with the saw automatically when the lever-head screw is tightened. A splitter guard is provided to prevent the stock from pinching the saw.

A switch for starting and stopping the machine is located on the front of the base. The machine is only 10 in. high in the bench style and 36 in. when mounted

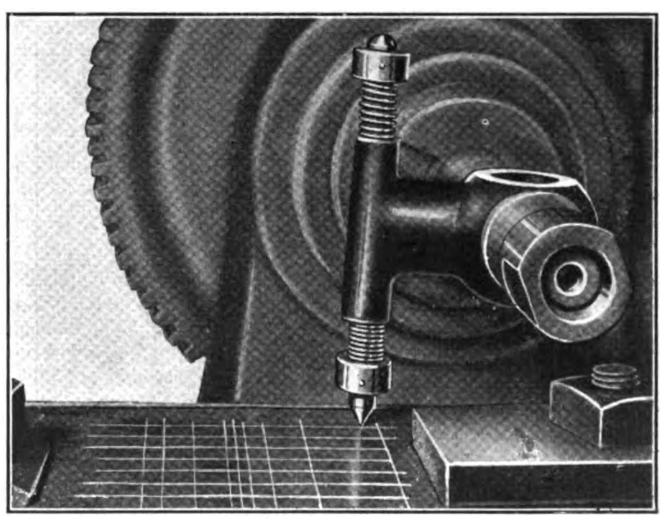
UNION PORTABLE UNIVERSAL SAW BENCH

on the base. The net weights of the two styles are 133 and 268 lb., and the weights crated 170 and 330 lb., respectively.

Johnson Center-Locating Punch

A combination prick punch and scriber for precision work in laying out centers for holes in jigs and dies has recently been placed on the market by Bernard F. Johnson, 3476 Boulevard, Jersey City, N. J. It is not necessary to employ buttons in laying out holes, as is ordinarily done. Holes can thus be placed very closely together, and the punch marks can be made in the desired positions without the possibility of interference that may occur between buttons.

The tool can be used in conjunction with a shaper, milling machine or other machine tool. Ordinarily, it is mounted on the cutter arbor of a milling machine, as



JOHNSON PRECISION CENTER-LOCATING PUNCH

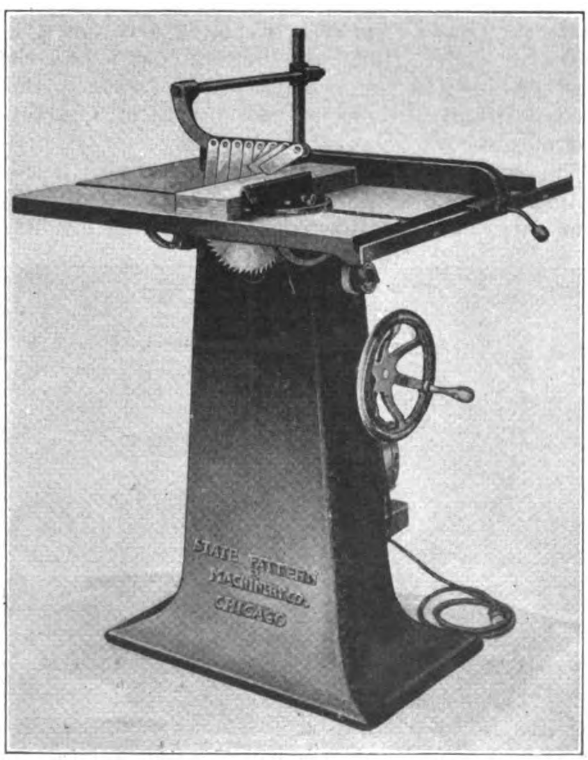
shown in the illustration, with the punch either perpendicular or horizontal. The work is attached to the machine table, and is moved by means of the machine controls. The operator observes the movement by means of the graduated dials on the screws of the machine, so that the required dimensions between marks may be easily obtained. After each adjustment of position, a prick mark can be made on the work by tapping the rear end of the punch with a hammer. When all the centers have been properly located, the work may be removed from the milling machine and held on the faceplate of a lathe. The ordinary method of indicating, drilling and boring the holes can then be applied.

It will be noted that movement of the punch stem in either direction is possible, the springs normally holding the tool at rest. The device may be employed in conjunction with a dividing head, where it is desired to swing the work about a center. The center point may be used as a scriber for marking lines directly on the work. The springs in this case serve to keep a constant pressure of the point against the work. As the part is moved by means of the machine controls, continuous lines may be made, so that the die can be easily laid out. A thin line is scratched by the point, which is hardened and ground all over.

The tool is of especial use when laying out cams, as the outline can be accurately drawn on the work before cutting is started. The two collars on the ends of the punch are of equal size, so as to facilitate alignment of the tool. As shown, the holes in the arm of the device are ¾ and ⅞-in. in size, for mounting on the arbors of milling machines.

State Universal Saw Bench

A universal saw bench for use in pattern, cabinet and carpenter shops, and in shipping rooms and foundries has recently been developed by the State Pattern and Machine Co., 2824 West Lake St., Chicago, Ill. The machine is intended primarily for use on wood, but can be employed for such purposes as sawing carbon, asbestos, fiber and even soft metal.



STATE UNIVERSAL PORTABLE SAW BENCH

The machine can be supplied with either a tilting or stationary table. The motor is of ½ hp., either Emerson or General Electric make, 110 or 220-volt, and for either a.c. or d.c. The height is 34 in., and the diameter of the saw is 8 in. The saw can be raised or lowered, and provides a maximum depth of cut of 2¼ in. The speed is 3,500 r.p.m. A guide is furnished which can be used on either side of the saw.

A guard is supplied which consists of several thin aluminum plates so arranged as to swing easily as the work is pushed past the saw, but to prevent entrance from the side or from above the saw. The machine is equipped with S. K. F. ball bearings. The endless belt is adjusted by means of a special device. The machine can be operated from an electric light socket.

Erratum

The address of the Frank O. Wells Co., Inc., of Greenfield, Mass., was incorrectly given as Springfield. Mass., in an article entitled the "Wells Screw-Plate Set" on page 494.

Reconstruction Hospital To Have Enlarged Facilities

As a direct result of the world-wide experiments in rehabilitation of men injured in war, America has now a hospital dedicated solely to the care of industrial diseases and accidents and the restoration of industrial casualties to active useful life again. Ground was broken on April 2, for the new eleven-story addition to the Reconstruction Hospital at 100th St. and Central Park West, New York City.

It is a new idea to have a hospital where men suffering from any of the many casualties of industry may receive the benefits of an intensive study of their cases by surgeons specializing in all the newest forms of therapy, combined with the complete after-care of the patient until he is fit to earn a livelihood. Yet in the brief life of the present hospital, men have been sent from all over the country to take advantage of its unusual treatment, and many suffering from seemingly incurable physical ailments and distortions have been returned to useful industrial life again.

Besides the usual equipment the new hospital will have the most extensive and complete physio-therapy plant in existence. There will be rooms for occupation therapy, especially designed equipment embodying the latest principles in rehabilitation, electro-therapy, and mechanical apparatus, whirlpool baths, and a gymnasium where a score of mechanical devices assist the patient in recovering the fullest use of stiffened joints and weakened muscles.

The total cost of the new annex will be $1,500,000. It is hoped to complete the first two stories at once to relieve the pressure on the present hospital in which an average of 175 cases receive treatment daily, half of that number being sent by the Government.

Officers of the governing board of the hospital are: President, W. Gilman Thompson, M.D.; chairman of the board of directors, Allen Wardwell; vice-presidents, John A. Hartwell, M.D., and Giraud F. Thomson; treasurer, Edward M. Townsend; secretary, Elwyn W. Poor.

Defendant Asks Rehearing of Open-Price Case

Rehearing of the open-price association practice in trade, or modification of the decree in the hardwood lumber case, to permit of the collection and dissemination of production, sales and stock reports, has been requested of the U. S. Supreme Court in a petition filed by the American Column and Lumber Co., defendants in the recent suit in which the court decided the practice was illegal because in violation of the anti-trust law. The lumber interests base their request on misinterpretation of certain phases of the case, and make general denial of the conclusions of the court that the purpose of the practice employed by the lumber interests was to curtail production or enhance prices.

Exhibit Road Machinery in South America

An exhibit is being planned by the Bureau of Public Roads of the United States Department of Agriculture, to be shown at the international exposition to be held at Rio de Janeiro, commencing next September, to stimulate trade in American made road machinery and motor vehicles. Models showing various steps in the construction of a road, colored transparencies and motion pictures will be used to illustrate American methods of road building. Manufacturers of road machinery and equipment are invited to exhibit.

The exhibit is also to cover highway transportation and this field will be covered by models being prepared by the National Automobile Chamber of Commerce.

Court Upholds Sugar Machinery Importers

The U. S. Court of Customs Appeals has decided the case of Cotton, Weill & Co., Ltd., involving the duty on centrifugal machines for use in the manufacture of sugar. They were assessed on importation, as dutiable by the collector of customs. The importers protested on the ground that the articles were knocked-down entireties and entitled to free entry as machinery for use in the manufacture of sugar. The Board of General Appraisers overruled their protest, but the court reversed its decision, sustaining the contention of the importers.

Annual Convention of Metal Trades

The twenty-fourth annual convention of the National Metal Trades Association will take place at the Hotel Astor, New York, on April 19 and 20. The program for this year, it is reported, is in many respects the most attractive which the association has ever been able to offer to its members and friends, subjects having been selected which it is felt everyone is vitally interested in at this time.

Among the subjects of importance to the metal trades which will be discussed at the convention, is that of training apprentices to be skilled all-round workmen. A committee on apprenticeship has been investigating the systems of various industries and will report at the convention.

Conditions in the coal mining industry and on the railroads will be discussed by speakers of national prominence; finance; the relation of the farmer to industry; the progress which the city of San Francisco and other large cities have made in emancipating themselves from labor union domination; future industrial conditions in the light of the European situation—are some of the subjects which will also be dealt with. Some of the speakers will be: Robert M. Lynch, of San Francisco; Harold G. Moulton, Chicago; Magnus W. Alexander, New York; E. L. Greever, Tazewell, Va.; James A. Emery, Washington, D. C.

The part played by the non-union coal operators of West Virginia in stabilizing conditions in that industry will be fully outlined by the Hon. E. L. Greever, of Tazewell, Va., counsel for the non-union mine operators of that district. Mr. Greever handled all legal matters arising out of the insurrection of last September. In view of the present labor difficulty in our coal mining industry, the subject is timely.

Ordnance Stores Moved

Under an appropriation of $1,642,351 made available by Congress in a deficiency bill, and approved by the President, the War Department is transporting ordnance stores to permanent storage points incident to the evacuation of ordnance depots of a temporary character heretofore maintained at South Amboy, Hammonton and Westville, N. J.; Middletown and Tullytown, Pa.; Seven Pines and Penniman, Va.; Sparta, Wis., and Toledo, Ohio.

Imports of Industrial Machinery in Egypt

A statistical study of Egyptian imports of industrial machinery in the last three years, just completed by the industrial machinery division of the Department of Commerce, shows that such imports from the United States in 1921 constituted 29.6 per cent of the total, compared with 12.3 per cent in 1920 and 15.6 per cent in 1919.

Egypt is not an industrial country, and the market for machinery is restricted. The most important Egyptian customers for such machinery are the various branches of the Egyptian government. The largest item on 1921 imports, after rail locomotives, was stationary internal combustion engines, valued at £302,762, of which the United States contributed only £4,614.

Rate Cut Not Ready

The decision of the Interstate Commerce Commission in the matter of a general reduction in rates, it now appears, will not be forthcoming before April 15. At present the case is being studied by the commissioners individually. If they should find themselves in substantial accord, the decision probably could be handed down as early as April 15, but should there be important differences between them, it obviously will extend the time required.

President Holds Up Patent Treaty

Action by the Senate authorizing the President to revive the patent convention entered into with Germany in 1909 has raised a storm of protest. As a result it seems probable that the President will withhold, pending an investigation, the notice reviving that treaty.

The 1909 patent convention with Germany provides that, in case the United States should amend its patent laws by the insertion of a working clause, this legislation would not apply to patents of German origin. The agreement is reciprocal.

There are certain American industries which are anxious to have this reciprocal safeguard, but the arrangement is regarded as being a very detrimental one to the chemical industry.

Chief sentiment for the revival of the treaty of 1909 is said to exist in the electrical industry.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

It is estimated that from 300,000 to 500,000 miners and 70,000 textile operatives are on strike, but the fact that these two great strikes have not seriously affected business attests the stolid confidence in the future that is now generally felt. The apparent unconcern of the public is due to a widespread belief that an adjustment by compromise will soon be reached and that a vacuum is being created in the supplies of cotton goods and coal that argues higher prices later on.

Concurrently the railroads are doing better, and Februray net earnings are substantially in excess of earlier expectations. Many other signs of increased activity are also to be noted. The Western Union Telegraph Co. reports a substantial gain in the number of messages handled, and the telephone toll business, local and long distance, is said to be at its peak.

Upon the theory that a nation wide improvement in business is impending, the financial markets have been active and buoyant. A large number of bond issues, including one for Czecho-Slovakia and another for the Republic of Santo Domingo, have been readily absorbed. The Victory war bonds have sold above par and most of the Liberty issues have crossed 99. On the advance a great many small holdings have been marketed and the money thus released is apparently being invested in other securities that promise a higher return and have greater speculative possibilities.

Speculation Rife

The many letters asking for my advice with regard to speculative investments that I have recently received indicate that the spirit of speculation is spreading, and the fact that some of my correspondents seem angered by my answers urging them to put their mony in a first mortgage on improved real estate is proof that the temptation to take a chance in the hope of making something more than compound interest is again becoming irresistible.

As the contagion of speculation spreads and the public becomes excited a further advance in the stock market is quite possible, if not probable. But even if I were willing, as I am not, to take the responsibility of recommending the purchase of any particular security I should feel impelled to point out that the stock market is now in the secondary stage of a bull movement. As it advances sharp reactions that will make marginal operations more and more dangerous are to be expected.

I feel at liberty to speak this word of caution because during the dark days of the past twelve months I was persistent in predicting that the golden flood by which the country has been inundated would ultimately submerge the wreckage of the late depression, and now that the conditions that I expected have developed the prudent should be on their guard lest they become the victims of a thoughtless public enthusiasm.

Of the commercial and industrial future it is possible to speak rather more confidently than of the stock market. The steel mills are running at 70 per cent of their capacity. The indications favor a further gain. The railroads are buying more freely and the building activity is almost phenomenal. In greater New York 27,839 apartments or tenements containing 107,054 rooms are in process of construction. From many other cities a similar building boom is reported. It is reflected not only in the demand for structural steel but in the sales of brick, cement and other building material. In one forenoon last week 16,500,000 brick were sold in New York, and the price of cement has risen to $2.90 per barrel. The shortage of housing will soon be a thing of the past and landlords are rather less exigent in their demands.

An improvement in the jewelry trade is another sign of returning prosperity. The diamond cutters are busy again for the first time in two years. A further advance in coffee which has carried the May option to nearly ten cents a pound, the rapidity with which the Cuban surplus of sugar has been distributed at advancing prices and a slight improvement in the market for crude rubber, which is said to reflect an increased demand for tires and automobiles, are other straws in the current of the commodity markets which indicate a greater willingness to buy on the part of the public.

Cotton has fluctuated within comparatively narrow limits. A prominent trader says that the market is "buffaloed" by the textile strike and the premium of 50 points on the May option in New York. It is said that this position has been cornered by a group who are reputed to hold contracts for the delivery of 750,000 bales.

The dry goods market is somewhat firmer but it is to some extent paralyzed by the strike and the artificial conditions which exist in the market for the raw material. It is, however, admitted that the shelves of distributors are very bare of cotton goods and their replenishment by active buying seems to be only a question of time.

Sales of fertilizers are rather below last year's figures and current guesses are that the acreage will be increased by not more than from 3 to 10 per cent.

Waiting for Russia

The grain markets are hesitant. Their future depends upon crop development and the outcome of the Genoa conference. Some think that if Russia is accorded commercial recognition there she might again become a large producer and exporter of wheat.

Lloyd George's Parliamentary victory, following his remarkable speech, has revived the hope of early and rapid recovery in economic conditions abroad. The market for foreign exchange is in consequence generally firmer, but German marks continue "droopy" at around 30 cents a hundred. The paper circulation of Germany has been increased by nearly eight billion marks and now stands at over 130 billion.

There has been a sharp advance in Mexican bonds. Many think that it presages President Harding's recognition of the Obregon government. It seems to be generally agreed that conditions in Mexico are decidedly better.

In Washington the best political opinion is that the Senate will pass the bonus bill with an amendment for the imposition of a sales tax. The folly of this course, if it is followed, is fully appreciated, but business men realize that the first effect of the proposed legislation, if it is enacted, will be inflation and higher prices. For this, most of them are, consciously or unconsciously, preparing. After the proposed largesse to the soldiers has been distributed and spent the prostration which always succeeds artificial stimulation will no doubt follow. Prudent men should therefore be prepared to step off the train when it commences to slow down, but as it has just started it may be unwise to look too far ahead.

The weekly statement of the Federal Reserve Banks shows an increase of nearly $8,000,000 in the gold held, but the reserve ratio is practically unchanged at 77.7 as against 77.8 per cent last week.

Government Sale of Standard Airplanes

Notice has been received from the office of the Chief of the Air Service, War Department, Washington, of the sale of a lot of standard J-1 airplanes and hangars. Sealed proposals for the purchase of these airplanes will be received at the material disposal and salvage section, Office of the Chief of Air Service, Room 2624, Munitions Bldg., Washington, D. C., until 3 p.m. Tuesday, May 2.

The airplanes are stored in the Aviation General Supply Depot, Houston, Texas. The equipment consists of fourteen standard J-1 planes which have never been used. These planes are not equipped with engines. Another lot consists of fifteen standard J-1 planes, not equipped with engines, which have been used and which need minor repairs. All the planes in this section are equipped with gasoline tanks, hand pump and air gage, but do not include instruments, accessories, spare parts, or tools.

The bids for the airplane hangars will be received up to May 8. These hangars are located at the Aviation General Supply Depot, Morrison, Va. The lot consists of twenty Alban-Richards Type B portable hangars, complete with canvas covering; forty-nine Alban-Richards Type A portable hangars, minus canvas covering.

Observations at the Leipzig Fair

Rapid Growth of German Machine Tool Industry—Present Design Based on Imitation, Rather Than Originality—Foreign Influence Missed

By OUR BERLIN CORRESPONDENT

The Leipzig Fair, at which the exhibition of machinery of every description has become a standing feature during the last two years, supplies a good picture of the activity of the German machine tool building industry. Recent developments have added considerably to the utility of fairs, which now spring up like mushrooms in all parts of Central Europe. Traveling has become expensive and cumbersome, and traveling salesmen are a species which, if not entirely extinct, has greatly diminished in numbers. Instead of the salesmen, the buyers are now traveling in search of the best purchases, and for them a general meeting place with a great number of sellers is a great convenience. Moreover, this year's Leipzig Fair takes place under a luckier star than its immediate predecessors, the sinking exchange naturally acting as a stimulant to foreign and domestic buyers. To the expectations based thereupon can doubtless be attributed the greatly increased number of exhibitors of all branches of industry, and the large number of visitors, surpassing all records of previous fairs. Buying is brisk, and although the reports launched in the newspapers are no doubt exaggerated, a very satisfactory volume of business has been transacted in domestic as well as foreign orders, although the hopes in the latter respect have not been nearly realized. Even at the machine tool exhibition, where in the preceding years hardly any actual contracts were concluded, a considerable number of sales have been transacted. Several exhibitors put signs on their machines indicating the number of orders received for that particular tool.

Machine Tools Predominate

The so-called technical exhibition, taking place on the exhibition grounds, which will be remembered by the members of the A.S.M.E. who visited Leipzig in 1912 as guests of the Society of German Engineers, now unites nearly all lines of engineering. The largest and most prominent space is occupied by the German machine tool industry, which exhibits collectively. The organizer, the Association of German Machine Tool Builders, is using all its influence in producing an imposing show. This year's result, evidently helped a good deal by the favorable market conditions, far surpasses all previous exhibitions. The space contracted for by the association was insufficient to house all exhibitors, and a large building had to be erected in haste. Even so, some of the exhibitors are found outside of the exhibition grounds, in the town proper.

The interest of the observer is naturally attracted to such new firms from whom novel designs can reasonably be expected. Most of these new firms originated from dealers taking a hand in manufacturing by entering into joint business with machine builders on the lookout for specialties, contracting with them for the manufacture of certain designs. In the same way a number of employees of machine tool companies in leading positions have contributed to the increase of machine tool manufacturers. Considering these facts, the exhibits of the new machine tool builders are very disappointing. Hardly without exception, they have not ventured from the beaten track. The lines adopted seem to have been selected, not with a view to satisfying a pressing demand, but rather from personal preference for certain designs and types. Independent inventive ideas, carried out with assuredness, are peculiarly absent. It is true, only a few started upon the already overcrowded field of standard machinery, but most of them encroached upon preserves already occupied by somebody else, with the sole justification of a few new and often needless improvements. The best that can be said for a number of so-called novelties is that their originators have studied the AMERICAN MACHINIST with great care and intelligence, patching together features picked out here or there. The copying of American designs from live machinery is now impossible owing to the absence of the latter, but new ideas developed in America are very useful as a guide and stimulant to the designers. As far as actual copying can be observed, it is based upon the types available from pre-war times, into which the designer has often incorporated his own ideas of improvement.

Lathes Most Prominent

Lathes form by far the most numerous group. The typical German gap lathe with flat bed did not put in an appearance. This type is slowly dying out, and where it is still made the makers seem to be ashamed to show it in public. It is now the ambition of every lathe manufacturer to produce lathes with V-ways, lead screw and feed rod, and change gear box. There is a strong tendency towards the single-pulley drive, not so much from actual demand but for gaining distinction. The ambition of the makers seems to end there frequently, although this does not apply to the leading manufacturers. The craze for all-geared headstocks is shown on a backing off lathe with single-pulley drive exhibited by Schütthoff & Baessler, one of the new firms, which is successfully combating the monopoly Reineckers have enjoyed for a long time in the making of backing-off lathes. Lathes with electric drive are also receiving increased attention. Several manufacturers show more or less happy solutions of this problem. In most cases the electric motor is placed on top of the headstock, the whole design bearing a rather makeshift appearance. In only one case can it be said that the problem has been attacked with the serious intent to produce a homogeneous design. This is the high-speed lathe made by Gebr-Boehringer, now probably the leading German lathe manufacturer. In this lathe the electric motor is put into the headstock casing, its axis in alignment with the spindle. So well have the designers utilized the space that the headstock is not much larger than in an ordinary all-geared lathe, and casual observers would probably pass it over as such a one. Headstock and motor form one compact unit. The latter is a reversible, variable speed motor for continuous current. Three speeds can be obtained through the gear box, giving in combination with the speeds of the motor a wide range of speed changes. As a further novelty in this lathe both lead screw and line shaft are driven through the gear box. The wiring for the motor is placed inside of the frame with the starter arranged in the cabinet foot under the headstock. When in position the power is carried to the lathe through cables in slots of the floor. The lathe is built in one size of 250 mm. height of centers, but in various lengths of bed. Gebr-Boehringer also show a heavy lathe on which tests are being made during the exhibition with stellite and Le Moyne steel in comparison with German makes. The stellite, which is now being sold in Germany through the Jaegerstahl Company, is still considered superior to all other makes where high cutting speeds are concerned, while the Le Moyne steel gave an excellent demonstration of its capacity in taking large feeds. Chips of 3½ mm. thickness and over 25.4 mm. wide, were cut from a piece of Siemens-Martins steel of 60 kg. strength, a record achievement of this lathe. Tests could not be carried out to the utmost limit of capacity, as the power supplied by the electric installation was not sufficient.

In the field of milling and drilling machines nothing essentially new is to be seen. The Wanderer Works, Germany's leading milling machine manufacturer, has evidently contented itself with improving the finish and workmanship rather than the design. It is now using hardened steel gears in the gear boxes. A milling machine with a double arm support of the spindle, a copy of the Milwaukee design, is shown. Ludwig Loewe shows a universal milling machine with a triple dividing head in combination with an automatic indexing device. In this exhibit a keyway milling machine is also to be seen; in this machine the cutter, at the end of its stroke, reverses automatically and repeats the stroke for cleaning out the cut, after which it is stopped automatically.

Electrically Driven Drills

A great variety of drilling machinery is shown, none of which presents any novelty. In several cases the machines are equipped with electric drive. Of gear cutting machinery very little is in evidence. Besides the well-known makes of hobbing machines, German copies of the Fellows gear shaper and the Gleason are most conspicuous. The Reinecker line of Bilgram machines is

absent. The Lorenz Machine Tool Works, which specializes in heavy gear cutting machinery, is showing a large machine for cutting herringbone pinions such as are used for turbine drive.

Of planers only a few makes are represented. A large planer is exhibited by Gebr-Boehringer, with greatly improved electric drive, for which the A.E.G. (General Electric Company) is responsible. By using an entirely novel arrangement of rheostats, the stoppage of the platen at the end of the stroke, or at any desired moment, by pressing a button, takes place with such precision that the most accurate work up to a shoulder can be performed. The novelty in this design is the automatic electric brake which comes into action before the return of each stroke, no matter whether the latter is actuated by dogs or by electric push buttons. The manner in which the brake acts varies according to the speed or length of stroke. In short strokes it is only small, and increases in proportion to the length of the stroke. The result obtained is astonishing; the reverse is entirely free of shock, even of the slightest vibration. The cutting speed can be varied between 5 and 12 in. There is a set of three buttons for starting, stopping, and reversing the platen, arranged at either side of the housing.

The Zimmerman Works, a German firm which during the last year has moved into the front rank of machine tool manufacturers, is showing a planer with a new device for the positive relief of the tool by means of a shaft placed in the toolslide and actuated at the end of each stroke through cams.

Automatics Prominent

In automatics several makes of the Gridley design are again prominent. The Pittler Works is showing an automatic of this type of unusually large dimensions, the spindle having 6-in. bore. As a novel feature of this automatic the cutting-off tool is placed vertically above the work. This firm has just published its balance sheet of last year's business, which supplies a striking instance of the prosperity which many of the German machine tool factories enjoy. The value of the buildings has been entered at less than two million marks, which now would hardly pay for the roof. The stocks of finished machinery and material, finished and semi-finished parts, figured at one and a half million marks, or hardly more than the price of the machinery visible at the exhibition.

From the commercial point of view the small automatics have been most successful. Of the many types of machines which Loewe has on exhibition, the small automatic of ¾-in. bore, which commends itself by its simple design, found largest interest amongst actual buyers. Ludwig Loewe has now re-established its foreign selling organization, and has appointed agents in all countries where it was represented before the war, including England.

A large number of makes of grinding machinery are represented, many by new firms. The only new item of interest in this field is the "Sun and Planet" system of crankpin grinding, shown by Friedrich Schmaltz. The grinding wheel, which is driven by electric motor, the two forming a compact unit, has besides its own rotation, a revolving movement around the work.

The number of single purpose machines to be seen is comparatively small. To the copy of the Lapointe broaching machine already existing, Alfred H. Schütte has added another. The Lapointe design is scrupulously followed, with only a few variations, especially in the arrangement of the driving parts. This firm is also showing a lathe for simultaneously turning, cutting-off and boring. This tool is made by the Schaerer Machine Tool Works, a lathe factory which Alfred H. Schütte bought some time ago. The machine works from bars fed through the spindle hole. It has two toolslides, one on either side, for the turning and the cutting-off tools respectively. The purpose of the machine is to manufacture rings in quantities. By the turning tool or tools the cross-section of the blank is divided into two or more rings, the center bore is performed by the boring spindle which runs in the tailstock and has a separate drive counterwise to the headstock spindle. It appears that Schütte is constantly expanding his manufacturing scope. In his double capacity of manufacturer and dealer the first seems now to be predominant, at least inside of Germany. The firm has re-established most of its pre-war time foreign branches and agencies.

In the small tools section little of interest is seen. The most prominent part of this section is occupied by Schuchardt & Schütte's exhibit of the precision measuring tools developed in connection with the well-known optical works of Carl Zeiss. While the machine tools this firm shows deserve no special mention, being designed on strictly conventional lines, the precision measuring tools represent, no doubt, the greatest progress achieved in Germany during recent years. The standard types of gages, of which various kinds are shown, are noteworthy only as specimens of the high-class work done in the Zeiss factory. However, in the combination of mechanical and optical measuring some great results have been accomplished. These optimeters, as they are called, are capable of correctly reading measurements down to 1/1000 part of a millimeter. Of special interest is the thread measuring optimeter, which is the most perfect and best of its kind known in Germany. The Zeiss instruments will probably be introduced in America as soon as their manufacture in quantities is assured.

Firms Expanding

Schuchardt & Schütte have been able to develop their organization and have increased their manufacturing lines. The latter consist of cutting tools and gages, several standard machines and a few single purpose tools. Another specialty of the firm is the manufacture of portable electric drills. The firm maintains its old established branches in Stockholm, Copenhagen, Vienna, Prague and Budapest. The branch in Milan was re-eopened on a larger scale than in pre-war times, and a sales office was established in Amsterdam a short time ago.

The Fortuna Works, manufacturer of the Hirth minimeter, has added a new feature to this instrument, which increases its value in shop practice. Two small electric lamps, a red and white one, are placed close to the reading dial. They are connected with the index finger, and can be adjusted to light up at required limits. Instead of lamps, electric bells of different sounds may be used so that the instrument can be handled by blind war invalids. The firm has received numerous inquiries for minimeters from America, but find the way to this market barred. The firm placed its agency in America with a New York firm. The shipments sent to this firm have been refused entry into American territory because of an injunction obtained by the former agent, the Norma Company of America. This injunction has of course been granted on the strength of the patent rights having passed into the possession of the American Norma Company, but the impression created in Germany is that German firms have no legal standing in the United States, although nearly four years have elapsed since the end of the war. For this reason they are shy in licensing new inventions to America, and many promising negotiations in this respect have broken down on such grounds.

A Thousand Designs

There are over two hundred machine tool makers represented at the exhibition, and more than a thousand tools of various makes and designs can be counted. With the few exceptions mentioned, none present any material news interest. Specialization has not advanced any further. On the contrary, it seems that works which have thrown overboard some of their lines, evidently with a heavy heart, are now branching out again. Specialization seems to be content to remain a doctrine only. Even young firms, starting out with single-purpose machines, show an inclination to take up other lines as they go along. The old German adage that one cannot stand on one leg is evidently being followed, disclosing a certain lack of confidence of the manufacturers in their designs. German firms maintain that their market is not large enough for such minute specialization as prevails in America, but as the production of the German machine tool industry is not far behind the American, such arguments are not convincing. The truth is that the makers instinctively incline to make the nets in which to catch the buyers as large and closely meshed as possible. Standardization of parts is also progressing very slowly. Manufacturers of measuring tools state that although new firms are frequently ordering their gages according to present standards, the old established firms are exhibiting strong conservatism, opposed to any change.

The general impression received from the exhibition is that only a few of the manufacturers are keeping in mind the building up of their production with a view to future business, and that most of them are solely thinking of the business of the present. In the latter respect good results are evidently obtained, and prosperity seems to prevail almost everywhere. The ill effects of the long seclusion from the outside world upon the moving spirit of the industry are strongly visible. New blood is urgently needed, and no greater service could probably be done to the German machine tool industry than if conditions would permit the importation of foreign machinery. As it is, a marked staleness prevails, which can be remedied only by foreign competition.

Growth of American Machinery Trade in China

BY A BRITISH CORRESPONDENT

One of the great outstanding features about China's trade today, is the steady rise of American commercial influence in that country. This is evidenced by the fact that the value of United States' exports to China has risen from 25 millions of dollars before the war, to about 150 millions of dollars last year. That, in itself, is a significant fact; and before dealing with the machinery and machine tool trade, I propose examining very briefly the causes of this increase. In 1914, there were only 136 United States commercial houses in China. Today there are considerably over 400. There are many causes operating to cause a favorable environment to American enterprise. Of course, the events of the war had some influence. The United States enjoyed peculiar advantages in that part of the world during the war, some time after hostilities ended, particularly in regard to early delivery of machinery. For some years English exporters of machinery could not deliver on any terms, and when the war ended they could do so only on terms that made business very difficult. Some of these advantages have passed and others are passing away and competition in future will be on more equal terms.

This large development of American trade in the Celestial Empire is recognized by all shrewd observers in Europe as a sure sign of her growing realization of the importance of the Pacific. British manufacturers realize that in future America will be a far more serious competitor than in the past. Several influences have been at work in promoting United States trade, influences which English traders often pooh-poohed and regarded as of little importance, but when taken in the aggregate are of great value. For instance, for years past Americans in China have been working very hard in educating the Chinese, building and endowing many schools and colleges; mixing in a spirit of real comradeship with the better class of Chinese in social functions; while their sympathy with the ideas and aspirations of "young China" has brought them into close association with the more progressive elements in the country. All these influences are factors and have had a certain cumulative effect. The influence, too, of American missionaries, working in a perfectly legitimate way, must not be ignored. It is undeniable that the United States business element in China has got much nearer to the hearts of the people than the representatives of most other countries, although, of course, all this would have been useless unless the American merchant had had a good article to sell.

A Closer Friendship

The "new ways" represented by American firms in China appeal also to the younger and more democratic Chinese merchants. The new spirit has become noticeable among Chambers of Commerce where the old-time conservative element has had to recognize the power of the younger men with their more go-ahead methods. This element is inclined to ignore the old traditions and methods of trade and to follow the system that offers more chances even if at the risk of occasional loss. This bolder spurt of enterprise has brought the two races much closer together than people in Europe can imagine.

A little while ago, the Hong Kong correspondent of the *Times* quoted some local selling prices of machine tools, etc., in South China. It should be pointed out that to the Chinese mind price is the chief consideration. Many buyers of engineering products are unable to distinguish between a very good article and one that may have a good appearance, but yet be a poor article. Only a comparatively few of them are able to judge the merits of design or construction. They will buy a very cheap tool in the hope that it may be a good one and that if not then it is only the loss of a few hundred dollars. This strikes the Western mind as rather a speculative way of doing business, but it is the Chinese method in many cases.

The local selling price of an English made screw-cutting 6-in. lathe is about £267, while the price of the foreign-made machine is quoted at about £130. Local quotations for an 8-in. British lathe is in the neighborhood of £400, while the foreign-made machine is sold at £230. The British 10-in. lathe is quoted locally at £537 against its competitors' price of £325. It is not suggested here for a moment that these machines are of equal value. An experienced eye at once notices the difference in design, construction and wearing efficiency. But as already stated, the majority of Chinese buyers in the engineering section cannot be regarded as at all competent judges as to the respective merits of competing machines. All they know is that there is a very large difference in price and they are largely blind to quality. The prices of American-made machine tools are reported by Chinese firms to be rather lower than those quoted for British machine tools.

A shaping and planing machine giving a 10-in. length of stroke (hand power) is quoted at £20. A British shaping machine (stroke to 12-in.) costs £200 in China, whereas a foreign firm is selling a 10-in. machine (not hand power) at £50, and a 16-in. machine at £106. In 1920 the latter machine was quoted at £126. British 16- to 18-in. machines are quoted locally at £250, against a 22-in. machine for £150 by foreign importers, the 18-in. machine being, £120. A British planing machine 6 ft. x 30 in. x 30 in. costs locally £625; a machine of similar dimensions imported from another part of Europe cost £370. A British 25-in. drilling machine costs locally £215, while its foreign-made competitor, a 24-in. drill, costs £68, and this is seen to be typical of drilling machines of all sizes and types.

The prices speak for themselves. It is felt by everyone handling British machinery and machine-tools in the Chinese market that unless very substantial reductions are made in price it will be well nigh impossible to compete in the open market against American and Japanese competition.

To illustrate further the seriousness of the present condition of affairs, I need only recall the instance of the contracts for supplying railroad material to certain lines in China six months ago. The value of the contracts was half a million pounds sterling for the supply of locomotives and wagons. There were 176 tenders from British, French, American, German, Japanese, Chinese and Belgian makers. As will be seen below the British prices were not even in the running, the Belgians carrying off all the business except for five engines of special U. S. A. manufacture.

Goods Required	Successful Manufacturers	Price	Lowest and Highest British Tender
30 Prairie Type Locomotives	Forges Usines et Foundries of Haine St. Pierre	£10,000 (approx.)	£13,075 to £18,732
6 English Type Locomotives	Forges Usines et Foundries of Haine St. Pierre	£10,050 (approx.)	£13,500 to £17,280
2 Mikado Type Locomotives	American Locomotive Co.	£12,500 $52,000	£14,904 to £17,000
3 Pacific Type Locomotives	American Locomotive Co.	£12,500 $52,000	£14,310 to £16,500
100 Steel Open Wagons	Compagne Central de Construction a Haine St. Pierre	£680 (approx.)	£1,016 to £1,340
100 Steel Covered Wagons	Compagne Central de Construction a Haine St. Pierre	£738 (approx.)	£1,160 to £1,470
40 Steel Covered Wagons	Compagne Central de Construction a Haine St. Pierre	£738 (approx.)	£1,160 to £1,510

In this case, little, if any, financial aid would have been required because the goods would be paid for within six months. The whole contract turned on the question of manufacturing costs, which were then and are still to a rather less degree, so high in the United Kingdom that British firms had absolutely no chance of competition with those of foreign nationalities. Failing the Belgian success, the work would have gone to America or to Germany. On some of the items in the table the highest among the British tenders were nearly double those of the Belgians.

The newly issued government report on China deals with this very question of contracting for railroad rolling stock and the general conditions relating thereto. It is pointed out that the conditions on which such orders are obtainable generally involve extended terms of credit, payment usually being spread over three or even five years and that this condition does not commend such business to English manufacturers, the report adds these words:

"It is evident, however, that so long as the Chinese railroads can find merchants or manufacturers of other countries willing to do business on these terms the market offers few opportunities to those who pursue a more conservative policy." Later on reference is made to offers said to have been made by American firms to allow payments for locomotives over a period of seven years. "It is obvious (it says) that no British manufacturer or mer-

chant house could afford to grant such liberal terms without some strong financial backing, and the question arises whether the time has not come to consider the establishment of an Anglo-Chinese Industrial Bank which would assist our manufacturers in financing large contracts involving deferred payments."

STATEMENT SHOWING THE EXPORTS OF MACHINERY FROM THE UNITED STATES TO CHINA DURING THE YEAR ENDING JUNE 30, 1914, AND THE CALENDAR YEAR 1920

Machinery, Machines and Parts Thereof	1914 Dollars	1920 Dollars
Adding and calculating machines	1,598	42,277
Air compressing machinery	7,859	53,230
Brewer's machinery	......	19,050
Cash registers and parts	3,795	19,410
Concrete mixers	N. s.d.	42,111
Cotton gins	368	20,445
Cream separators	411	2,898
Elevators and elevator mach'y	10,340	28,102
Electric locomotives and parts	......	90,150
Internal combustion engines:		
Stationary, gas and parts	• 2,914	20,594
Automobile gasoline parts	......	1,675
Marine gasoline parts	19,330	60,867
Stationary gasoline parts	11,404	135,674
Traction gasoline parts	......	29,814
Kerosene (traction)	N.s.d.	9,512
All other	N.s.d.	31,317
Steam locomotives and parts	328,629	3,370,510
Steam marine engines and parts	......	56,636
Steam engines, stationary and parts	136,307	364,731
Steam engines, traction and parts	......	......
All other engines	4,662	158,837
Engine parts, not elsewhere specified:		
Boilers		345,950
Boiler tubes	40,771	167,211
Other parts		1,106,001
Laundry machinery: Power machines	1,420	18,644
All other	408	4,006
Lawn mowers	224	1,212
Metal working machinery:		
Lathes		241,433
Other machine tools	17,668	413,039
Sharpening and grinding		55,317
All other		222,562
Meters, gas and water	N.s.d.	11,907
Milling macninery—flour and grist	132,635	539,032
Mining machinery— oil well	......	32,505
All other	4,004	40,966
Paper milling machinery	3,292	48,418
Printing presses	5,192	324,016
Pumps and pumping machinery	14,333	445,026
Refrigerating machines	584	93,421
Road making machinery	N.s.d.	15,135
Sewing machines	28,055	768,931
Shoe machinery	......	2,679
Sugar milling machinery	......	28,079
Textile machinery	3,149	3,798,673
Typesetting machines, linotype and other	562	12,503
Windmills	609	1,694
Typewriting machines	46,822	246,611
Woodworking machinery:		
Sawmill machinery	305	27,663
All other	975	71,388
All other machinery and parts	175,266	3,163,728

Note: N.s.d. Not separately distinguished.

The Trend of Business Improvement—Plants Resuming

The Western Electric Co., Hawthorne, Ill., has adopted a production schedule calling for 900,000 complete telephone instruments during the present year, in addition to 9,000 switchboard sections and other electrical equipment.

The Grand Trunk Railroad Co. has resumed operations at its repair shops at Battle Creek, Mich., following a few weeks' shut down. A force of 550 men will be employed.

The Carnegie Steel Co., Pittsburgh, Pa., has resumed operations at the 10-in. rolling mill at its Mingo Junction, Ohio, plant, following a shut down of about a year. The mill will give employment to about 100 men.

Thomas A. Edison, Inc., West Orange, N. J., is resuming production on an increased capacity basis in all departments at its local plant, with greatest advance in the storage battery branch of the business. Employment is being given to about 3,000 operatives, and this working force will be increased by about 100 employees a month.

The Wilson Foundry and Machine Co., Pontiac, Mich., a subsidiary of the Willys-Overland Co., Toledo, Ohio, has increased production from 50 to 100 Knight motors per day, and during the present month plans to advance the output to 125 motors per day, reaching full capacity. The company is now giving employment to about 1,500 men at the plant.

The Norfolk & Western Railway Co. is developing capacity operations at its machine and repair shops at Shenandoah, Va., and a large number of men are being added to the working force.

The Baldwin Locomotive Works, Philadelphia, Pa., has contracted for locomotives to an amount of more than $1,000,000 during the past fortnight, including twenty-five engines for the Chicago, Milwaukee & St. Paul Railroad Co., and three locomotives for the Alabama & Vicksburg Railroad Co. The company now has unfilled orders on hand totaling in excess of $10,000,000.

The American Car and Foundry Co. has received a contract from the Norfolk & Western Railway Co., for 1,000 steel hopper cars, and will handle the work at its Berwick, Pa., plant. The working force is gradually being increased, and it is expected that a quota of 3,500 men will be on the payroll early in May.

The Bethlehem Shipbuilding Corporation, Wilmington, Del., will soon add 100 additional men to the working force in the car shops at its local Harlan works, making a total of 700 men in this department. The company has contracted for 140 all-steel cars for different railroads, in addition to an order for 250 such cars for the Pennsylvania lines.

The General Electric Co. is increasing the working schedule at its Pittsfield, Mass., plant, and taking on a number of new employees. Operations have been increased more than 20 per cent since the first of the year.

The Davies & Thomas Co., Catasauqua, Pa., manufacturer of iron and steel castings, will resume operations at once on a full capacity basis, following the securing of a contract from Booth & Flinn, Inc., New York, contractor for the New York-New Jersey vehicular tunnel under the Hudson River, for 48,000 tons of cast-iron segments, to be used in connection with the project. The company is making inquiries for 50,000 tons of pig iron to be used for the work.

The Dort Motor Car Co., Flint, Mich., is increasing production at its plant and rapidly reaching capacity output. Manufacture of completed cars during March was 229 per cent in excess of production in February, while the figures for the last noted month were 150 per cent over those of January.

The American Steel and Wire Co., Allentown, Pa., has adopted a capacity schedule at its local plant, increasing operations from two to three shifts a day, giving employment to more than 1,000 men. Orders on hand insure this basis of output for an indefinite period.

The axle plant of the Olds Motor Works, division of the General Motors Corporation, Lansing, Mich., has adopted a full time operating schedule, giving employment to close to 1,400 men. The plant will produce 15,000 sets of axles for the Oakland Motor Car division of the corporation, on a basis of 125 sets a day. In addition the plant will produce 90 sets a day for the Oldsmobile car, making a total output of 215 sets of axles daily. It is planned to increase the present working force by about 100 men within the next few weeks.

The Ford Motor Car Co., Detroit, Mich., is operating its Canadian plant on a production basis of 4,000 automobiles a month. The Manchester, Eng., plant of the company is running on a production schedule of 2,000 cars a month, while the Buenos Aires, Argentina, works are producing on an average of 1,250 cars and trucks monthly.

The Chevrolet Motor Co., Bay City, Mich., is running on a daily production schedule of 800 motors and 900 axles in these departments, at its local plant.

The Birdsboro Steel Foundry and Machine Co., Birdsboro, Pa., has adopted an increased operating schedule at its plant. An order for car bolsters has been received from the Philadelphia & Reading Railroad.

The Vulcanite Roofing Co., Anderson, Ind., manufacturers of composition roofing products, is increasing operations at its local plant, and has added 80 employees to the working force during the past fortnight.

The Philadelphia & Reading Railroad Co. has placed orders with the Bethlehem Steel Co., Bethlehem, Pa., for 10,000 tons of 100-pound rails, and 3,000 tons of 130-pound rails; and with the Carnegie Steel Co., Pittsburgh, Pa., and the Midvale Steel Co., Philadelphia, Pa., for 5,000 and 2,000 tons, respectively, of 130-pound rails.

The Crescent Washing Machine Co., New Rochelle, N. Y., has been running at practically normal for some time and finds business conditions improving. The production at the present time, which is chiefly of dish-washing machines, is stated to be 80 per cent of the maximum production that the company has ever had.

The Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., has received orders for five large booster converters with transformer equipment. The orders aggregate about $250,000 and will take six months to complete.

The Van Norman Machine Tool Co., Springfield, Mass., is increasing its output of its new grinding machine, the Re-li-o, and has developed a new machine, embodying the same general ideas, but suited to wet grinding, which is now being put in production.

New York Central Railroad has ordered 19,000 freight cars from the Standard Steel Car, American Car and Foundry, Pressed Steel, Pullman, General American Tank Car Co. and Rolston Steel Car Co.

During the month of March this year the National Cash Register Co., of Dayton, Ohio, did four times as much business as compared with the same month last year.

Cincinnati Letter

Machine tool builders in this city report that they are receiving few orders from widely scattered sources, which seems to indicate that business is picking up in this line, but is still far from normal. Dealers in used equipment report increased sales, and in some instances have been unable to supply the machines wanted. One purchasing agent who wanted a certain kind of lathe, found two dealers who could supply this machine, but before he had made up his mind which one to purchase from, both machines were sold to out-of-town customers. This is mentioned as an instance of how sales are being made today.

Several machine tool manufacturers are doing work for builders of radio apparatus. The Crossley Manufacturing Co., manufacturer of radio outfits, has taken over the plant of the Greaves-Klusman Tool Co., and will employ about 300 men in this growing industry. The plant will be operated by the American Automobile Accessories Co., which is a subsidiary of the Crossley concern. The main factory of the Crossley company will continue at Northside.

A great many of the machine tool men in Cincinnati will attend the meeting of the National Machine Tool Builders' Association in Atlantic City, N. J., on April 25 and 26.

James C. Smith has resigned from the Eastern Machinery Co., and has opened salesrooms at 6 East Third St., where he will deal in machine tools and equipment under the name of the Smith Machinery Co.

Chicago Letter

Although there are conflicting reports concerning business during the month of March, all dealers seemed to be pleased and feel that the first week in April has brightened the outlook by the increase in prospects and the amount of buying. There has not been the slightest decrease in the amount of inquiries since the first of the year.

It is understood that the John-Manville Co. has purchased part or all of the tools listed in the recent inquiry for the Waukegan plant. The report that the Universal Portland Cement Co. had purchased against its outstanding list has been denied on the grounds that the appropriation to cover the purchase of the machines has not yet been secured. One of the largest orders received by a local concern was for twenty-two nail machines.

A slight development is noted in railroad activities. The Santa Fe system has issued the following additions to its outstanding list: One No. 4 milling machine, one 40-in. turret lathe, one 24-in. lathe, flue testing machines, one Morton 36-in. shaper, four 20-in. lathes, one emery wheel stand and a boiler-maker's flange clamp. The Burlington recently inquired for a 1½-in. triple head bolt cutter and a heavy-duty drill. The Illinois Central, which it is reported, recently purchased a 24-in. x 12-ft. engine lathe, has not issued any inquiries recently and the engine lathe is evidently something inquired for some time ago.

A number of shop-owners who have found their present equipment more than adequate for their needs, are disposing of many of their machines to other manufacturers at prices far below their worth, seemingly unaware of the fact that fair prices could be obtained for these machines in the regular used-machinery markets.

Business Outlook in Foreign Markets

Cable reports to the Department of Commerce show an increased activity in foreign markets. The improvement reported in February in the demand for American products continues.

The demand for machinery in the Dutch East Indies is of exceptional interest to American manufacturers, because this market was practically neglected until circumstances connected with the war brought about an increased demand for American machinery. Since that time the United States has shared to a considerable extent in this trade. In 1900 it represented a total value of over $4,000,000 per year; by 1911 it had increased to $8,000,000; in 1914 it was $10,000,000, the trade being handicapped due to the war, but in 1919 it rose to about $22,000,000.

Since Chinese import trade has recently revived and the building of business houses, roads, railways and factories has been resumed, it is interesting to know what part Germany is taking in this. The *Deutsche Handelsdienst* states that German firms are doing a large business in electrical machinery. A German company is competing with an American firm for the contract of putting in a telephone system in the principal city of Shantung. Also in Shantung a sugar refinery is to be established, which will have a working capital of £2,500,000 and which will require a complete new outfit of machinery.

A considerable amount of new government construction work which would involve the use of steel is contemplated in Quebec, Canada. During the period July 1, 1920, to June 30, 1921, fifty-eight steel bridges were built in the Province and fifty-five (thirty-two all-steel and twenty-three reinforced-concrete) are under construction.

During 1921 the United States shipped to Alaska seventy passenger cars, valued at $75,242, and fifteen motor trucks valued at $10,279. The registration of motor vehicles in Alaska shows a total of 384 passenger cars and 153 motor trucks.

Cost of Castings Over the Country

Although machinery casting work is essentially a labor proposition, requiring separate detail and an individual price on each casting, a certain uniformity in rates per pound is noticeable throughout the various important industrial centers.

Prices vary, depending upon quantity, weight of casting, and on the nature of the work. The type of pattern or the shape of a given piece of work may also materially affect the price. However, certain minimum and maximum rates apply to most castings, based upon the cost of the metal used and the difficulty of the operation.

In the accompanying table current rates are shown in twelve large cities. These prices, which represent average conditions, fluctuate but slightly from week to week, being governed by conditions in the metals market and the cost of labor, as well as by the size, weight and specific details of the job. For instance, few foundries can compete at a rate under 3c. per lb. for gray iron, regardless of the size of the casting, while a rate exceeding 16c.@20c. per lb. would seldom be charged on gray iron castings even of light weight and in small lots. Minimum and maximum rates on all types of jobs taken into consideration, it appears that in most instances a price of 5½c.@6c. per pound is fairly representative of the cost of medium weight gray iron machinery castings on the present market.

MACHINERY CASTINGS — IN CENTS PER POUND:

		Gray Iron	Steel	Brass	Bronze	Aluminum Alloy
Pittsburgh	—Light	9.0	16.0	30.0	34.0	65.0
	Medium	6.0	10.0	27.5	30.5	52.5
	Heavy	3.0	6.0	25.0	29.0	40.0
Philadelphia	—Light	9.0	14.5	14.5	15.0	25.0
	Medium	5.5	12.0	....	....	....
	Heavy	2.65	12.0	5.0	....	....
Atlanta	—Light	5.5	22.5	25.0	25.0	65.0
	Medium	4.5	20.5	22.0	22.0	60.0
	Heavy	4.0	18.5	20.0	20.0	50.0
Detroit	—Light	7.0	17.0	35.0	....	....
	Medium	4.5	12.0	30.0	....	....
	Heavy	3.0	7.0	22.0	....	....
Birmingham	—Light	16.0	....	33.0	33.0	70.0
	Medium	7.5	....	30.0	30.0	59.0
	Heavy	2.5	....	28.0	28.0	48.0
Denver	—Light	8.0	30.0	30.0	40.0	60.0
	Medium	6.0	15.0	24.0	31.0	50.0
	Heavy	5.0	7.0	19.0	27.5	40.0
New Orleans	—Light	9.0	12.0	25.0	36.0	50.0
	Medium	6.0	10.0	19.0	26.0	45.0
	Heavy	4.0	9.5	....	22.0	35.0
Minneapolis	—Light	9.0	17.0	28.0	30.0	70.0
	Medium	8.0	11.0	25.0	28.0	60.0
	Heavy	4.5	7.5	22.0	25.0	50.0
New York	—Light	9.0	22.5	30.0	34.0	65.0
	Medium	6.0	16.0	27.0	31.0	57.5
	Heavy	3.0	10.0	25.0	29.0	50.0
Cincinnati	—Light	5.0	15.0	20.0	20.0	50.0
	Medium	4.5	11.25	16.0	16.0	45.0
	Heavy	3.75	7.5	12.0	12.0	40.0
Cleveland	—Light	6.75	18.0	30.0	32.0	75.0
	Medium	4.5	13.0	25.0	27.0	60.0
	Heavy	2.6	9.0	20.0	24.0	45.0
Montreal	—Light	...	....	....	....	....
	Medium	...	....	....	....	....
	Heavy	...	....	22.0	30.0	35.0

Business Items

The Cleveland office of William K. Stamets has been moved to 974 and 976 Kirby Bldg. George D. Miller is manager of the Cleveland Office. The Stamets organization recently concluded agency arrangements with a group of Hartford manufacturers, including Billings & Spencer Co., Hanson-Whitney Machine Co., Hartford Tap and Gauge Co., Taylor & Fenn Co., and the Whitney Manufacturing Co.

Jones, MacNeal & Camp, manufacturers of "Power King" electric drills, have moved from Chicago to a new plant at Warsaw, Ind.

The Wiederboldt Construction Co., of St. Louis, Mo., has opened offices at 30 Church St., New York City. J. D. Martin is in charge. The company builds a patented chimney for smelters and steel plants.

The Western Radio Manufacturing Co., 11 South La Salle St., was recently incorporated by Sidney Saldinger, H. E. Wilmore and Charles Gollay, with a capital stock of $20,000, to manufacture and deal in radio apparatus.

The Combustion Engineering Corporation has opened a branch office at 1137 Guardian Bldg., Cleveland, Ohio. Frank Henderson has been placed in charge.

The Wright-Hibbard Electric Truck Co., of Buffalo, N. Y., has purchased the Collins Iron Co. building in Phelps, N. Y., and will convert it into a factory for the manufacture of electric industrial trucks.

The Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., has received a contract from the Southern California Edison Co., for electrical equipment for a powerhouse at Big Creek. The aggregate consideration is said to be $1,500,000.

The Electric Furnace Co., Alliance, Ohio., has moved its general sales offices from Alliance to Salem, Ohio. All departments will be consolidated at the works on Wilson Street.

The Hibbard Manufacturing Co., Joplin, Mo., is building an addition to its plant in that city. This new building will take care of the manufacture of sludge tables, and when completed will afford employment to several machinists.

The Domex Co., of Buffalo, N. Y., manufacturers of small metal parts, has secured lease on a factory building at Akron, N. Y., and will remove from Buffalo. The Domex Co. is now negotiating for the plans and patents of the Kaman Auto Radiator Co., of Akron, and will install machinery and equipment for the manufacture of radiators and tubular specialties.

The interests of H. H. Hall in the Draper & Hall Co., Middletown, Conn., have been purchased by G. E. Quinn, who now becomes general manager of the concern. The business will be continued under the old name, expanding later into the manufacture of automatic grinding machines and twist drills.

The Garlock-Walker Machinery, Ltd., of Toronto, Canada, has been changed to the Garlock Machinery, Ltd.

The American Bosch Magneto Corporation reports, for the year ended Dec. 31, 1921, a deficit of $2,049,992, after an inventory adjustment of $1,813,815. After deducting dividends of $120,000, there was a deficit for the year of $2,169,992. That result compares with a net income of $945,700 in 1920.

Announcement has been made in Baltimore that the Richmond, Va., plant of the Chicago Nipple Manufacturing Co. has acquired a plant in Baltimore and will move to that city. It is expected that the new plant will be ready for operation in May.

The Andrews Iron and Steel Corporation recently started operations in its new plant at Utica, N. Y. The company has remodelled the plant formerly occupied by the pipe foundry of the International Heater Co., and with new machinery will manufacture structural steel and bridge shapes. Officials of the company are: President and general manager, George W. Andrews; vice-president, O. J. McKeown; treasurer, F. J. McMackin; secretary, C. A. Schmidt.

The Universal Tool Co. has been organized at Garwood, N. J., with a capital stock of $125,000. Directors are W. H. Osborne, Jr., D. B. Smith and Blair Reily, of Newark, N. J.

The locomotive department of the Beech Grove, Ind., shops of the Big Four Railway Company, which has been closed since Feb. 15, was reopened under the contract plan by the Railway Service and Supply Corporation, which is also operating three other departments in the shops. E. S. Pearce, general manager for the contracting corporation, said the success with which his corporation had operated the three other departments in the shops had been responsible in a measure for the decision of the Big Four Railway officials to adopt the contract plan for the locomotive department and he said it was gratifying to know that the men themselves preferred it to the old system of dealing direct with the railroad company because they could earn more money.

Personals

JAMES L. O'NEILL, formerly inspector in charge of tools and gages at Frankfort Arsenal, is now with the Budd Wheel Corporation, Philadelphia, Pa.

GUY CUNNINGHAM has been appointed receiver of the Rivett Lathe and Grinder Co., of Boston, Mass.

PATRICK J. FOY has resigned his position as safety engineer at the Willys-Morrow plant at Elmira, N. Y., and will engage in private business.

M. W. TABER is now special representative for the Motor Wheel Corporation of Lansing, Mich., with offices in Detroit.

CHARLES E. FOUHY, of Boston, Mass., has been secured by the Willys-Morrow Co. to head the employment bureau at the Elmira plant.

R. P. RAYMOND, formerly chief draftsman for the Columbia Graphaphone Manufacturing Co., of Bridgeport, Conn., has been appointed superintendent of manufacture for that company in the plant at Toronto, Canada.

PROF. SIMON T. HART, of the College of Applied Science, Syracuse University, Syracuse, N. Y., addressed the Technology Club of Syracuse at a recent meeting. His subject was "Cams, their Design, Construction and Uses."

RICHARD G. PLUMLEY has been appointed manager of the order department of the Yale & Towne Manufacturing Co., Stamford, Conn. He will be assisted in this position by George L. Hodges.

WILLIAM H. WOODLIN, president of the American Car and Foundry Co., sailed last week for Rome, where he will attend the International Railroad Congress to be held in that city on April 15.

GINJIRO FUJIHARA, president of the Oji Paper Manufacturing Co., of Tokyo, Japan, with his purchasing manager, Yasunosuke Fukukita, and three departmental heads who are touring United States and Canada, investigating paper-making machinery and mechanical equipment, recently spent some time at the plant of Bagley & Sewall Co., in Watertown, N. Y.

NORMAN L. SNOW has resigned his position as vice-president and active head of the Terry Steam Turbine Co. of Hartford, Conn., to become president and treasurer of the Diamond Power Specialty Corporation, of Detroit, Mich., a new company which has purchased the business and plant of the Diamond Power Specialty Co.

F. S. HICKLING has been appointed manager of the railway division of the Westinghouse Electric and Manufacturing Co., Pittsburgh office. Barton Stevenson is now in charge of the power division and S. R. Shave of the price section.

WILLIAM E. DOUGHERTY has joined the sales force of the Independent Pneumatic Tool Co., of Chicago. Mr. Dougherty will make his headquarters at the Philadelphia office.

G. F. SHERRATT has been appointed manager of the Pittsburgh office of the Chain Belt Co., of Milwaukee. The Ward Equipment Co., of Pittsburgh, will continue to handle the complete line of "Rex" products, made by the Chain Belt Co.

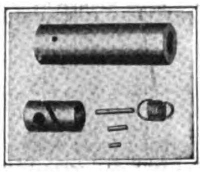
GEORGE S. BARTON, president and treasurer of the Rice, Barton & Fales Machine and Iron Co., Worcester, Mass., paper and pulp machinery manufacturers, will leave on a business trip to Europe about the middle of April.

L. D. MOWERY has been appointed general manager in charge of production of the Mills Company, Cleveland, Ohio. Mr. Mowery has been a designer and manufacturer of steel factory equipment for more than twenty years, and was the founder of the Metal Crafts Company. More recently he was consulting engineer for the E. F. Hauserman Co., Cleveland. The Mills Company produces steel shelving, sash, skylight frames, partitions, cabinets, tables and the like.

Condensed-Clipping Index of Equipment

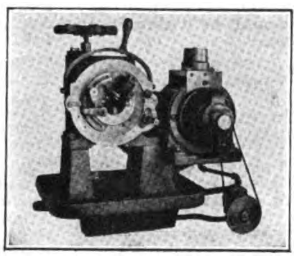
Patented Aug. 20, 1918

Oiler, Cone-Pulley, "Flush"
Sexton Machine Co., 308 Pearl St., Hartford, Conn
"American Machinist," December 15, 1921.



The oiler is adapted for use in cone pulleys especially, but also for pulleys running on shafts or studs. The body of the oiler is a steel tube of sufficient length to reach from the surface of the pulley to the bore, and is ground on the outside diameter to a drive fit in a standard reamed hole. When filled with oil the plug is snapped back to place, flush with the surface of the pulley, preventing the escape of oil. The tube and hollow body of the plug constitute the reservoir. The oiler is made in ¼, ⅜, ½ and ¾ in. sizes, and with any length of tube desired.

Threading and Cutting Machine, Pipe, Motor-Driven, Forbes, No. 4
Curtis & Curtis Co., Railroad Ave. and Garden St., Bridgeport, Conn.
"American Machinist," December 22, 1921.



The head of the machine is mounted in a supporting shell, is rotated by a direct-connected electric motor and has an automatic release and cam lock. Longitudinal travel is provided for the head, to feed the dies on the pipe. An automatic feed is provided for the cut-off device. The machine is intended for mounting on a bench, but can be equipped with a floor stand and a high adjustable pipe rest. Three sets of dies each are furnished with the machine, as well as three cut-off tools. The machine has a range of ¼ to 2-in. right-hand threads, and requires a 1-hp. motor running at a speed of 1,800 r.p.m. Height, 20 in. Bench space, 24 x 16 in. Weight, 350 lb.

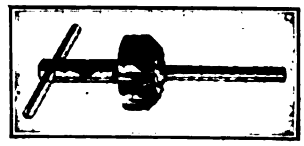
Grinding and Sanding Machine, Spindle-type, "Little Wonder"
Wonder Grinder Co., 612 West 12th Street, Erie, Pa.
"American Machinist," December 22, 1921.

The machine is intended for internal circular grinding on both wood and metal. The table is circular, and can be tilted 45 deg. to either side. It automatically locks at right-angles to the spindle, or may be locked in any desired position. The abrasive spindle is mounted on a vertical shaft, and driven directly from a ⅓-hp. removable electric motor mounted vertically in the base. The spindle has an adjustable top bearing and runs at a speed of 1,725 r.p.m. It is 9 in. in length and is provided in diameters of 1¼, 2⅜ and 4½ in. with an oscillation of ⅞ in. The motor can be furnished for direct or alternating current of 25, 40 or 60 cycles. The controlling switch is on the front of the column. Table, 20½ in. in diameter. Height, 37 in.

Stand, Garage, "Champion"
Western Tool and Manufacturing Co., Springfield, Ohio.
"American Machinist," December 22, 1921.

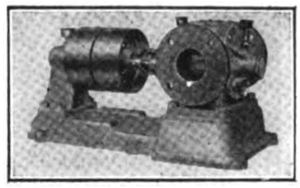
The stand is made of steel throughout, the trays being of pressed steel and the supporting frame of heavy pipe. A plain-jaw "Champion" vise No. 13 is mounted on the table. A drawer is provided for tools. A brake can be easily operated by the lever underneath the vise, and when locked it prevents movement of two of the casters. Height, 39 in. Length: top shelf, 42 in.; middle and bottom shelf, 43 in. Width: top shelf, 14 in.; middle and bottom shelf, 26 in. Drawer, 14 x 14 x 4½ in.

Valve Reseating Tool, Automotive
New Britain Tool and Manufacturing Co., New Britain, Conn.
"American Machinist," December 15, 1921.



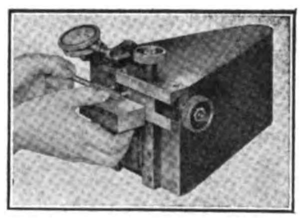
In this tool for resurfacing the valve seats of automobile engines, the cutter is made like a shell reamer and is a slip fit for the shank, upon which it is held against turning by a short spline or pin fitting into a notch in the shell. It is of high-carbon steel and may be furnished in any required angle, though it is stocked in angles of 30 and 45 deg. The pilot portion of the shank is furnished in any diameter to fit standard sizes of valve-stem guides, or it can be made to fit oversizes. Cutters and shanks are interchangeable, so that any combination may be quickly secured.

Pump, Rotary
Exeter Machine Works, Inc., West Pittston, Pa.
"American Machinist," December 22, 1921.



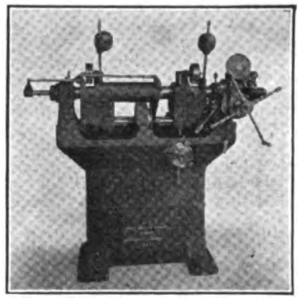
This pump handles liquid of any specific gravity and is adaptable to machine shop use for circulating lubricating oil and coolant. The inner rotor is keyed to the driving shaft. The outer rotor has four ports which open into the chambers of both the suction and the discharge side of the pump during rotation. The pump has no reciprocating parts, operates at comparatively slow speed and delivers a continuous flow of liquid. It is stated that under normal barometric conditions it gives 28 in. of vacuum. Small pumps tested are said to have shown a volumetric efficiency of 98.67 per cent, and a pumping efficiency between 70 and 82 per cent. The pump can be furnished with the body strengthened to operate against a pressure of 600 lb. per square inch.

Gage, Thread-Lead
Toledo Tap and Die Co., Clinton St., Toledo, Ohio.
"American Machinist," December 22, 1921.



The device gages the lead of threads and was originally developed to check the lead on the taps and precision studs made by the concern. The gage consists of an arm 8 in. long pivoted on an adjustable bearing. A hardened and ground point engages the thread tested, and is connected with the dial gage to register the accuracy of the work. One of the measuring points is movable, and can be set within a range of from ⅛ to 2 in. An elevating table holds work up to 2 in. in diameter. The adjustable point is set to the zero position from a master thread gage and the threads of the work are pressed against the measuring points. Any difference in lead from the master setting is registered on the dial gage.

Grinding Machine, Hole, Double-Head, No. 2
Bryant Chucking Grinder Co., Springfield, Vt.
"American Machinist," December 29, 1921.



The machine grinds such internal surfaces as the pin holes in gas engine pistons. Two sliding and swinging heads are suspended from the heavy bar at the top of the machine. Both wheels are in the cut together, each grinding an end of the hole. All the movements are controlled by the capstan wheel and traversing mechanism at the right. The wheels are fed to the work in grinding, or to the diamond in redressing, by a handwheel on the front of the machine. Standard Bryant internal grinding spindles are used, running at 20,000 r.p.m. The spindle driving pulleys run upon independent ball bearings, as also does the chuck or work holder. The chuck will take pistons up to 4½ in. in diameter and 4½ in. long. Floor space, 3 x 6 ft. Weight, 2,300 lb., including countershaft.

Clip, paste on 3 x 5-in. cards and file as desired

Obituary

HENRY HESS, founder of the Hess-Bright Manufacturing Co., Philadelphia, Pa., died in Atlantic City, N. J., on March 23. Mr. Hess was also the founder of the Hess Steel Corporation, of Baltimore, and was at one time president of the Engineers Club of Philadelphia, the Society of Automobile Engineers and vice-president of the American Society of Mechanical Engineers. He was also interested in many other engineering societies and held active membership in the following: American Institute of Mining Engineers, Society of Automotive Engineers, Franklin Institute and the Institute of Engineers of Great Britain.

JOHN MCDONALD, proprietor of the old Belpe-McDonald Foundry at Lawrenceville, Pa., and later organizer of the Pittsburgh Foundry and Machine Co., died at his home in Pittsburgh on March 21. He was 70 years old.

SAMUEL MCCLURE, vice-president and general manager of the Stewart Furnace Co., Sharon, Pa., died at his home in Sharon on March 24. He was 83 years old.

LOUIS A. DUHME, of Lawrenceburg, Ind., a member of the firm of George H. Bishop Saw and Edge Tool Manufacturing Co., died recently at his home. He was 69 years old.

LAWRENCE B. JENCKES, a director of the Crompton & Knowles Loom Works, Worcester, Mass., died on March 29. He was 55 years old.

WILLIAM F. MCNABB, secretary and treasurer of the Vanadium Metals Co., died suddenly in Pittsburgh on Mar. 28.

KNOX TAYLOR, president of the Taylor-Wharton Iron and Steel Co., died at his home in High Bridge, N. J., on April 4.

FRANK H. UNDERWOOD, retired manufacturer of machinery and belting, died at his home in Auburndale, near Boston, Mass., on April 3. He was 74 years old.

Trade Catalogs

"Germ Process" Motoils: Henry Wells Oil Co., 11 Haymarket, London, S. W. 1, England. Pamphlet containing information of value to those interested in the lubrication of plant and machinery.

Sprague Dynamometer: The Sprague Electric Works, New York City, N. Y. Bulletin No. 48,716 describing the Sprague electric dynamometer used in research work in various plants and laboratories.

Air Compressors: Curtis Pneumatic Machinery Co., St. Louis, Mo. A thirty-six page catalog describing a line of air compressors. Particular attention is given to the Model B, single stage, two stage and truck tire air compressors.

The Spindle Book: Jacobs Manufacturing Co., Hartford, Conn. A sixty-page well-bound reference book containing the spindle specifications of various types of drilling equipment. The book is made up of the names of sixteen firms using taper shank drills, taps or drill chucks, with the kind of equipment used. The book is intended for free distribution among dealers in machine tools and supplies.

Commutator Troubles: The Martindale Electric Co., Cleveland, Ohio. A four-page circular covering commutators, grinding and undercutting. A separate card gives a list of commutator troubles, their causes and remedies.

Flexible Shaft Equipment: The Hergi Manufacturing Co., Bridgeport, Conn. A catalog describing and illustrating several tools adapted for grinding, chipping and screwdriving. The equipment is of the portable type featuring flexible shafts and couplings.

Johnson Tools: Johnson Tool Co., Providence, R. I. Circular illustrating and describing the Johnson cutter plate and die milling machine. Specifications and working data are inclosed.

Whiting Cranes: The Whiting Corporation, Harvey, Ill. A four-page circular describing in a general way the Whiting line of electric and hand-power travelers, bucket handling and gantry jib, pillar and bracket cranes.

Electric Grinders: Columbia Manufacturing Co., Belleville, Ill. Supplement A to Grinder Book No. 26 describing a line of electric grinders and buffers; also the self-contained type of grinder. List prices are included.

Deschanel Cableway. Deschanel Engineering Corporation, New York, N. Y. The Deschanel cableway bulletin describing a single line cableway for use in handling materials in railroad yards, docks, power houses and other plants. The bulletin contains much useful information and interesting reading matter.

Torchweld Instructions. Torchweld Equipment Co., Chicago, Ill. A very valuable instruction book for oxy-acetylene welding, cutting, lead burning and carbon burning. The information is presented in an easy reading manner and would be valuable to shop men or executives.

Locomotive Repairs. The Cincinnati Milling Machine Co., Cincinnati, Ohio. A large thirty-two page booklet of data and experimental matter in milling operations in railroad repair work. The booklet is intended to show the variety of work that can be done in railroad shops by Cincinnati milling machines, and gives some interesting data compiled from experiments.

Book Reviews

Milling Cutters and Milling. A treatise based on the results of experiments conducted by Prof. Airey of the University of Michigan and Carl J. Oxford, chief engineer of the National Twist Drill and Tool Co., 69 pp., 5 x 7½ in. Illustrated. Published by the National Twist Drill and Tool Co., Detroit, U. S. A. Price, $1.

A recent paper presented before the American Society of Mechanical Engineers gave the results of experimental research on milling cutters carried on by Prof. Airey and Mr. Oxford at laboratories of the University of Michigan. In this book the data gathered during the course of the experiments and previously are treated in a somewhat less technical manner for those interested in the art of milling.

The authors point out that the discovery, made some years ago, that a given amount of material could be removed with less power if a cutter with few teeth were used than if the cutter had more teeth, "would have been very important if the proper deductions had been made and incorporated in the design of milling cutters. However, it was simply concluded that the coarse-tooth cutter in itself was a more efficient tool. * * * A careful analysis of the discovery mentioned shows us, not the efficiency of coarse-tooth cutters, but the efficiency of taking heavy instead of thin chips." They contend that sufficient chip space is the important factor in determining the tooth spacing.

The book is easy reading and is a worth while contribution to our knowledge of cutting metals.

Materials of Construction. By the late Prof. Adelbert P. Mills of Cornell University. Second edition, edited by Harrison W. Hayward, professor of materials of engineering, Massachusetts Institute of Technology. Cloth board covers, 476 pp., 6 x 9 in., 192 figures. Published by John Wiley & Sons, Inc., 432 Fourth Ave., New York, N. Y. Price, $4.

In this second edition, the book has not been changed fundamentally from the original work published in 1915. However, certain of the chapters have been condensed and parts of others have been rewritten, while several new chapters have been added. In addition, the book has been divided into sections, each treating of a different material employed in construction.

The volume treats of the manufacture, properties and uses of various materials employed by the engineer, the subjects being covered in considerable detail. However, intricate problems in chemistry and metallurgy are not handled. Although the treatment is more comprehensive than ordinarily required for classroom purposes, the incorporation of valuable material in the volume increases the usefulness of the book as a reference work.

The subjects treated in the various sections are: Plaster, lime and natural cement; portland cement and concrete; stone; bricks and other clay products; the ferrous metals; the non-ferrous metals and alloys; timber; rope; and mechanical fabrics. The most extended treatment is, of course, given on the subject of the ferrous metals.

Forthcoming Meetings

National Metal Trades Association: Annual convention April 17 to 20, Hotel Astor, New York City. H. W. Fisher, 1022 Peoples Gas Building, Chicago, Ill., secretary.

American Gear Manufacturers' Association: Sixth annual meeting, Buffalo, N. Y., April 20 to 22. Secretary, F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Southern Supply and Machinery Dealers Association: Annual meeting, Birmingham, Ala., April 24 to 26. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, A. M. Smith, c/o Smith-Courtney Co., Richmond, Va.

National Machine Tool Builders' Association: Spring convention, Hotel Traymore, Atlantic City, N. J., April 25 and 26. Ernest F. DuBrul, 817 Provident Bank Bldg., Cincinnati, Ohio, general manager.

National Research Council: Annual meeting of executive board, April 26, Washington, D. C. A. D. Flinn, 29 West 39th St., New York City, chairman.

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York City, May 8, 9 and 10. Secretary, George Boudinot, 50 Church St., New York.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

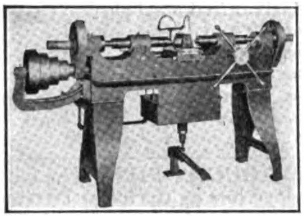
American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

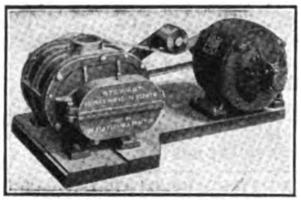
Reaming and Chamfering Machine, Opposed Spindle
Murchey Machine and Tool Co., Detroit, Mich.
"American Machinist," December 29, 1921.

The machine is intended for reaming and chamfering nipples, but can be equipped with dies for threading nipples from ⅛ to 2-in. pipe size, or can be arranged for threading tees, valves, studs and other work threaded on both ends. The nipple is held in a central vice opened and closed by a treadle. The spindles carrying the tools are fed to the work by the pilot wheel. The countershaft has two drive pulleys for different speeds, and together with a 4-step cone pulley, provides for eight changes of speed. The capacity is for nipples for ⅛ to 2-in. pipe, and 12 in. in length. Floor space, 8 x 2 ft. Weight, 1,200 lb.



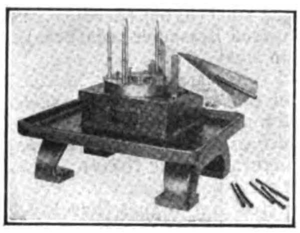
Blower Unit, Motor-Driven, Positive-pressure, Stewart
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," December 29, 1921.

This blower unit supplies the pressure for a heat-treating furnace independent of the main power plant; and obviates the expense of running the large plant motor when only enough power is required to operate the blower. It is adaptable for small installations, and is made in four sizes accommodating blowers Nos. 3 to 6 with motors of from 1 to 2½ hp.



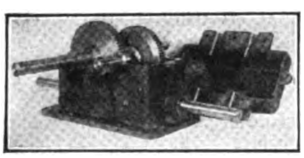
Marking Machine, Tubing, Rotary
Noble & Westbrook Manufacturing Co., Hartford, Conn.
"American Machinist," December 29, 1921.

The machine is used for stamping names and patent marks on small tubing, and is power driven through a three-step cone pulley. Power is transmitted to the table through worm gearing. The table of the machine revolves, passing the work over the die and making the mark. It is divided into six equal parts, each having a mandrel upon which the work is fed by hand. A cam, raising a lever, ejects the work automatically. The machine can be furnished for marking any size tubing of short length. It weighs about 90 lb.



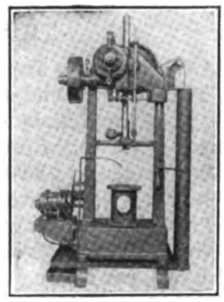
Speed Transformer, Combined Worm and Spur Gear
Natisch Gear Works, 451 Hudson Ave., Brooklyn, N. Y.
"American Machinist," December 29, 1921.

The transformer can be furnished for speed reductions ranging from 75:1 to 600:1 by using different gear ratios. The illustration shows a transformer for delivering ½ hp. at a speed reduction of 600:1. The case is cast iron, oil tight and rust proof.



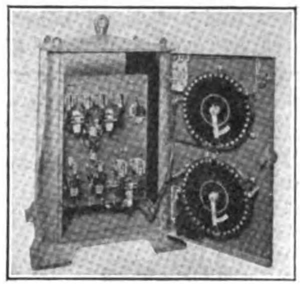
Broaching Press, Vertical, Power
Lucas Machine Tool Co., Cleveland, Ohio.
"American Machinist," December 29, 1921.

The machine is intended for the operation of push-broaches. It requires only short broaches, and allows the work to rest on a horizontal surface. Motion is transmitted to the ram through gearing controlled by a lever at the front. A gage mounted on the ram registers pressure exerted. The motor runs at 1,200 r.p.m., and is of either 7½ or 10 hp. The machine is made in two sizes, with capacities of 15 and 30 tons, respectively. The speed of the ram on the cutting stroke is 9 ft. and 6 ft. per minute respectively, and on the return stroke, 21 and 15 ft. per minute. The maximum distance from base to ram is ordinarily 48 in., but may be either 60 or 72 in. Weights, 2,900 and 3,800 lb. respectively. Export box, 125 and 150 cubic feet.



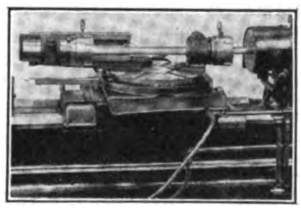
Control, Planer, Electric, G.E.
General Electric Co., Schenectady, N. Y.
"American Machinist," December 29, 1921.

The apparatus prevents tables of electrically controlled planers from overtraveling, employing the dynamic system of braking. The equipment consists of a control panel on which are mounted rheostats and contactors, resistance, master switch or push button, which is used in connection with a standard direct-current, reversible adjustable-speed motor. The control is furnished in two types, one with and one without a resistance-selecting contactor. The selective resistance contactor enables the machine to operate with small tool clearance, and also where the duty varies from no load to full load, and where cuts are made to the end of the travel.



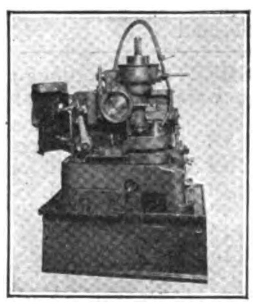
Staybolt Attachment, Threading
Acme Machine Tool Co., Cincinnati, Ohio.
"American Machinist," December 29, 1921.

The attachment is intended for use on turret machines. Two dieheads are used, and when set by a master or staybolt tap, their simultaneous cutting insures that both threaded portions on the staybolt will have the same lead as a continuous thread. The diehead at the rear is adjustably mounted, so that any length of staybolt within range of the adjustment can be cut. The attachment is made to fit the 2¼ x 26-in., 3¼ x 36-in., and No. 3 universal machines. By its use staybolts can be made from forging or from a bar.



Gear Shaper, High-Speed, No. 7
Fellows Gear Shaper Co., Springfield, Vt.
"American Machinist," January 5, 1922

The shaper is intended to handle any form of gear in a standard automobile transmission, and can also be adapted to the cutting of helical and herringbone gears. It performs roughing and finishing cuts automatically at the same setting and with the same cutter. A gear-type cutter is used to generate the teeth. The light weight cutter spindle is held in a straight path by guides, and is reciprocated by a connecting rod and crank arm. The work spindle carries a reverse-taper arbor. Gears are provided for securing seven feeds. The coarsest feed is 435 strokes for one revolution of the cutter; the finest feed is 1,735. Roughing and finishing cuts are taken at the same feed and speed.



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The Weekly Price Guide

THIS WEEK'S MARKET

Advances—Pig iron, No. 2 foundry, up $1 per gross ton in Philadelphia and Chicago; foundry, basic and bessemer up $2.46 in Pittsburgh. Basic in better demand in the Eastern states. Steel sheets up $3 per ton at Pittsburgh mills; quoted at $3.90 as against $3.75@$3.90 per 100 lb. in New York warehouses.

Tin quoted in New York at 30½c. as against 29⅝c.; lead at 5¼c. advanced from 5 1/16c. and zinc at 5⅝c. as compared with 5⅜c. per lb. one week ago. Brass rods up 1c. and brass wire 1¼c. per lb. in Cleveland.

Declines—Nickel ingots and shot quoted at 36c. as against 41c; electrolytic at 39c. as compared with 44c. per lb. formerly. Monel metal products down 2c.@6c. per lb. f.o.b. Bayonne.

The official Pittsburgh mill price of $1.50 for structural shapes and soft steel bars continues to gain in firmness. Plates, however, are quoted at $1.40@$1.50 per 100 lb.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21.00
Northern Basic	21.02
Southern Ohio No. 2	21.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.87
BIRMINGHAM	
No. 2 Foundry	16.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22.26
Virginia No. 2	28.74
Basic	20.25
Grey Forge	21.00
CHICAGO	
No. 2 Foundry local	20.70
No. 2 Foundry, Southern, sil 2.25@2.75	22.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.46
Basic	20.46
Bessemer	21.46

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.0	5.0	2.63
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	16.0	7.5	2.5
Denver	8.0	6.0	5.0
New Orleans	6.0	5.0	4.0
Minneapolis	9.0	6.0	4.5
New York	9.0	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3 85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized steel sheets:				
Nos. 10 and 11.	3.00	3.90	3.75	4.15
Nos. 12 and 14.	3.10	4.00	3.85	4.25
Nos. 17 and 21.	3.40	4.30	4.15	4.55
Nos. 22 and 24.	3.55	4.45	4.30	4.70
No. 26	3.70	4.60	4.55	4.85
No. 28	4.00	4.90	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.56	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	4.98
Cold finished shafting or screw	3.35	3.00	3.15
Cold finished flats, squares	3.85	3.50	3.65
Structural shapes (base)	2.48	2.31	2.38
Soft steel bars (base)	2.38	2.21	2.28
Soft steel bar shapes (base)	2.38	2.21	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.48	2.31	2.38
Bar iron (2.00@2.10 at mill)	2.38	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/32	8.50		12@13
1/8	7.15		11@12
5/32 to 1/4	6.75		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.50
Tin, 5-ton lots, New York	30.50
Lead (up to carlots), St. Louis, 4.90; New York	5.25
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.00	6.50	6.25
Copper sheets, base	19.50@20.50	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.25	16.00	15.75
Brass wire (carlots)	16.75	17.75	.....
Zinc sheets (casks), (8% dis. carlots)	9.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....
Solder (½ and ½), (caselots)	18.00	22.00	19.00
Babbitt metal (best grade)	30.80	39.50	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	10.00	9.25
Copper, light, and bottoms	8.50	8.50	8.25
Lead, heavy	3.75	3.50	3.65
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.00
Brass, light	4.25	4.25	4.75
No. 1 yellow brass turnings	5.00	5.00	5.00
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	12.00	14.50
IC,	112 sheets	12.80	12.30	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	\$0.07½@\$0.10	\$0.12	\$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13½x13½	....	50.00	55.00
Wiping cloths per M., 13½x20½	....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.82@.83	1.06	.90
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville...per net ton			\$3.25@\$3.50
Coke, prompt foundry, Connellsville...per net ton			\$4.25@\$4.75

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	60–5%	60–10%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	....	\$4.00 off
Button head bolts, with hex. nuts	35%	\$3.90 net	.....
Hex. head and hex. nut bolts	40%	....	65-5%
Lag screws, coach screws	65%	....	65-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	....	55%
Tap bolts, hex. heads	25%	....	....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	\$4.50	\$3.50	\$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	\$3.35	\$3.25	\$3.00
Cone heads, ditto (net)	3.45	3.35	3.10
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	....	0.15
⅝ in. diameter *EXTRA*	0.15	....	0.15
½ in. diameter *EXTRA*	0.50	....	0.50
1 in. long, and shorter *EXTRA*	0.50	....	0.50
Longer than 5 in *EXTRA*	0.25	....	0.25
Less than 200 lb *EXTRA*	0.50	....	0.50
Countersunk heads *EXTRA*	0.35	......	\$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	......

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	\$0.65	\$0.50	\$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40–10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	\$5.84	\$3.85	\$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

NEW *and* ENLARGED

Machine Tools and Machinery Wanted

Machinery wants published without charge

Machine Tools

Conn., Bridgeport—The Fabric Machine Co., 307 Centre St., manufacturer fabric cutting machinery—one 12 in. or 13 in. x 16 ft. lathe (used).

Del., Claymont—The Worth Steel Co.—motor driven plate shear, with knife 80-110 in. long, ⅜ in. cutting capacity.

D. C., Wash.—The Southern Ry. 1300 Pennsylvania Ave., C. R. Craig, Genl. Purch. Agt.—valve seat planer.

Ia., Dubuque—Adams Co., 295 6th St.—sheet metal brake for 10 gauge material, (used preferred).

Ia., Muscatine—The Roach & Musser Co.—Model B Mattison turning lathe.

Ill., Chicago—The Atchison, Topeka & Santa Fe R.R., 80 East Jackson Blvd., M. J. Collins, Purch. Agt.—one 500 ton double end hydraulic wheel press; one 90 in. motor driven driving wheel lathe; one heavy duty double end car axel lathe with motor drive; one 300 lb. Beaudry hammer; one 52 in. car wheel lathe; one 4 ft. radial drill and one 15 ton crane.

Ill., Chicago—The Natl. Stamping & Electric Wks., 424 South Clinton St.—two Brown & Sharpe No. 2½ hand screw machines.

Ill., Chicago — The Paidar Co., 1129 North Wells St.—one No. 2 Universal milling machine; one 4 spindle back geared drill press; one 2 spindle small drill press.

Ill., Chicago—W. A. Spinks & Co., 362 West Erie St., A. Hoskin, Purch. Agt.—one small engine lathe, Star preferred or similar make.

Ill., Chicago—The Underwriters Laboratories, 207 East Ohio St., W. H. Merrill, Pres.—one 20 or 24 in. Barnes Drill Co., self oiling, all geared drill and tapper, geared motor drive, also a 24 in. Potter & Johnson universal shaping machine, geared motor drive, (both used).

Ill., Englewood—The Englewood Optical Co., 5958 Eggleston Ave., E. E. Hilborn, Mgr.—small screw cutting lathe, bench or engine type with draw in spindle and collets, milling attachment and usual equipment. Want to use lathe for experimental tool and instrument work, 6 to 8 in. swing, 15 to 18 in. between centers, weight between 75 and 150 lb., small bench drill press of sensitive type and small shaper, 4 to 8 in. stroke, if possible with slotting attachment, or milling machine that would answer same purpose as shaper.

Ky., Central City—The Triangle Machine Wks., Inc., W. B. Mix, Secy. Treas. and Genl. Mgr.—one 26 ft. and one 8 ft. lathe; milling machine; 48 in. radio drill press; 60 ton hydraulic press; cylinder grinder; hack saw and other small tools, (used).

Mich., Detroit — The Central Machine Products Co., 1052 Morrell St.—one 20 in. to 24 in. back geared drill press (used).

Mo., Joplin—Fifiels & Jones, 2330 Anna Baxton Ave. (machine shop and planing mill), O. K. Jones, Mgr.—planing machinery and lathe.

Mo., Joplin—The Ozark Motors Co., 822 Joplin St., A. McClaren, Purch. Agt.—boring machine for automobile cylinders.

N. J., Plainfield—The Natl. Vitaphone Corp., 112 North Ave., (phonographs), C. B. Repp, Pres.—punch presses, screw machines and other automatic machinery.

N. Y., Brownville—F. Page—threading and tapping machine for Water Bd.

N. Y., Lowville—G. A. Smith Co., State and Jackson St., G. A. Smith, Purch. Agt.—small back geared engine lathe; miller and upright post drill; air compressor and tank.

N. Y., Ogdensburg—E. and H. Burns Co., 22 Lake St.—sheet metal punch press and one forming roll.

N. Y., Ogdensburg—Starter, Ignition & Battery Service Co., 23 Washington St., G. P. Haven, Purch. Agt.—light lathe to carry polishing mandrel also complete battery recharging machinery and equipment.

N. Y., Utica—A. Becker, 513 William St.—one 16 in. black geared engine lathe and bench miller also high speed twist drills.

N. Y., Waverly—The James Taylor Co., Fulton St., (battery repair and charging)—complete battery charging plant and machinery and equipment for repairs.

O., Cincinnati—The Jones Machine Tool Co., 435 East Pearl St., A. Jones, Purch. Agt.—one 48 in. x 20 ft. lathe; 72 in. boring mill; 60 in. open side planer, 12 ft. table; 24 in. shaper.

O., Cincinnati—W. Powell Co., 3233 Colerain Ave., manufacturer of valves—double spindle milling machine for milling tapered squares on valve stems.

O., Cincinnati—The Randle Mchy. Co., 1735 Powers St., G. Bierbaum, Purch. Agt.—angle iron shear to cut and punch 6 in. angles; 8 in. Bignall & Keeler pipe threading machine, motor driven, 250 volt, D. C. motor; hydraulic wheel press 200 to 300 ton; car wheel boring mill for wheels 33 in. diameter, on thread, and to bore 4½ in. hole.

O., Cincinnati—The Smith Mchy. Co., 6 East 3rd St., J. G. Smith, Purch. Agt.—one No. 60 Heald cylinder grinder; 20 in. drill press and a No. 13 Toledo or No. 39 Bliss press with 3 in. stroke.

O., Cleveland—Chandler & Price Co., 6500 Carnegie Ave.—heavy duty drilling machine.

O., Cleveland—The Cooper Spring Co., 2220 Center St.—Brinnell-Hardin testing machine.

O., Cleveland—The Rail Welding & Bonding Co., 1615 Collamer St.—one 80 to 100 ton geared press, (used).

O., Marion—The Murdock Dishwashing Machine Co., P. H. Ryder, Pres.—several kinds of metal working machinery.

Pa., Corry—The United States Chair Co., J. B. Patterson, Pres. and Treas.—one back knive lathe.

Pa., Pittsburgh—C. L. Flaccus Glass Co., 1107 Empire Bldg.—one 16 in. and one 18 in. lathe suitable for glass mould work.

Wis., Madison—W. F. Clark, 2105 Keyes Ave.—equipment for garage, including pumps, oil storage tank, etc.

Wis., Milwaukee—A. Graunke & Son, 431 28th St. (sheet metal workers)—sheet metal brake and gutter former.

Wis., Milwaukee—The Wisconsin Auto Exchange, 115 Sycamore St.—one gear press.

Wis., Milwaukee—C. Zawatzki, 851 Sobieski St.—lathe, drill press and gasoline storage tank and pump.

Wis., Sparta — F. J. Domke — equipment and auto repair machinery for proposed garage on South Water St.

Wis., Stockbridge — The Stockbridge Sheet Metal & Plumbing Co., c/o N. Karls—sheet metal working machinery.

Ont., Delhi — M. C. Beecroft — complete equipment for modern garage and auto repair shop. Estimated cost, $10,000.

Ont., Sarnia—The Dominion Alloy Steel Corp., Sarnia, C. H. Wills, Marysville, Mich., interested — equipment and electrically operated furnaces for steel plant on St. Clair St.

Ont., St. Thomas—The City Council, A. Stokes, Chn. — equipment for repair shop and gasoline station.

Machinery

Fla., Bradentown—J. L. Waterbury Co.—complete narrow gauge railroad equipment, including locomotives, cars, tracks etc.

Ga., Thomasville — The Dawes Constr. Supply Co., P. O. Box 314, J. P. Dawes, Mgr.—complete line of machinery for the manufacture of sand paper.

Ia., Des Moines—The Des Moines Printers Exchange, 310 2nd St.—printing press and stereotype machine.

Ill., Chicago—G. A. Deveneau, 652 South State St.—filter press, 2 ft. square, 8 to 12 leaves, with or without pump, electrical or steam driven (used).

Mass., Boston—W. H. Field Co., 39 Washington St., N.—woodworking machinery.

Mass., Whitinsville—The Whitin Machine Wks., Main St.—one 20 ton hand power crane, 45 ft. 8 in. span.

Mich., Detroit—A. W. Fellers, 6035 14th Ave.—planer and matcher, (used).

Mich., Detroit—E. R. Sloat, 5983 Woodward Ave.—complete plating outfit, (used).

Minn., Baudette—V. H. Ricci, P. O. Box 101—type setting machine.

Minn., Minneapolis—H. C. Johnson, 2730 Lyndale Ave., S. (creamery products)—power machinery, churns, mixers, etc.

Minn., Minneapolis — The Strutwear Kniting Co., 731 East 14th St. — W. A. Struthers, Secy.—kniting machinery, full fashion, for proposed factory.

Minn., Minneapolis—The Western Newspaper Union, 200 North 3rd St.—cylinder cutter.

Minn., St. Louis Park—The Minneapolis Concrete Co., J. C. Melville, 818 Builders Exchange Bldg., Minneapolis, Secy.—belt elevators, mixers, block machine, gravity conveyors, lift truck, and two electric motors.

Minn., Wells—The Mirror, J. E. Schofield, Purch. Agt.—four page press.

Mo., Dodson—L. Stewart—one 6 x 9 circular printing press and type.

Mo., Joplin—W. F. Bamett, 1607 Main St.—electric paper cutter for job printing plant.

Mo., Joplin—D. W. Gahagan & Son, 107 West 9th St., E. M. Gahagan, Purch. Agt.—printing press.

Mo., Joplin—The Joplin Machinery Exchange, 211 East 4th St., R. M. Clark, Mgr.—two or three 2, 3, 4 or 5 ton 24 or 36 in. gage electric locomotives for mine work, either storage battery or trolley type (used).

Mo., Kansas City—Brown-Preuss Stationery Co., 918 Grand Ave., J. Brown, Purch. Agt.—multi-color printing press.

Mo., Kansas City—The Drovers Telegram Co., Inc., 1505 Genesee St., W. P. Neff, Purch. Agt.—folding machine for newspaper plant.

Mo., Kansas City—The Lion Oil & Refining Co., 622 Finance Bldg., V. H. Smith, Secy.—one 1,200 bbl. agitator; 4 miles of 4 in. pipe line; couplings; 15,000 bbl. steel water top tank; 8 miles of 2 in. extra heavy pipe; miscellaneous valves and fittings.

Mo., Kansas City—The Lowell Press, 3017 Main St.—printing press and supplies for job printing plant.

Mo., Maplewood—H. E. Lousche, 7208 Anna St.—woodworking machinery for saw mill.

Mo., Springfield—W. E. Green, 719 Boonville Ave.—small tools including hammers, anvils, chisels, wrenches and automatic bellows.

Mo., Valley Park—The Barbour Boat and Pattern Co.—straightening machine and rolls.

Neb., Lincoln—The Nebraska Material & Supply Co., 117 North 9th St., W. H. Bixby, Purch. Agt.—belt driven air compressor, capacity 50 cu.ft., 60 to 70 lb. pressure, (used).

N. J., Newark—W. H. Hall, 563 18th Ave. power feed rod and Dowel machine, Hawker No. 2 (used).

N. Y., Binghamton—The Binghamton Limestone Co.—rock crushing, conveying and grinding machinery for agricultural lime plant.

N. Y., Binghamton—W. S. Jennings, 91 Carroll St.—pneumatic marble cutting, polishing and marking machinery and tools.

N. Y., Brooklyn—Berman Bros. & Lindeman Co., Inc., 2384-2392 Atlantic Ave., manufacturers of knit goods—knitting machines, 7 and 9 in. Sniker top, 2 or 4 feed, 285 and 365 needles to the cylinder.

N. Y., Brooklyn—A. Starke, 50 Columbia St.—electric hoist, ½ ton, a.c.

N. Y., Buffalo—Bd. Educ., 1401 Telephone Bldg., D. J. Sweeney, Purch. Agt.—receive bids until April 19 for woodworking tools.

N. Y., Caledonia—The New York Alfalfa Mills, H. R. McKay, Purch. Agt.—grinding, sieving, elevating and conveying machinery and equipment for feed mill.

N. Y., Canandaigua—The Central Sash & Door Mfg. Co., R. E. Pool, Purch. Agt.—double surface planer; rip saw and table; sander.

N. Y., Cattaraugus—F. E. Cobane, Jefferson St.—air compressor and tank 200 lb. pressure; hydraulic rim press and 2 ton triplex chain hoist.

N. Y., Corning—Allen & Andrews Chocolate Co., 67-71 West Market St.—W. W. Allen. Purch. Agt.—candy making machinery and equipment.

N. Y., Corning—The Corning Brush & Sponge Co., Hart St., A. Anderson, Fuller Ave., Purch. Agt.—special woodworking machinery for the manufacture of brush backs and handles.

N. Y., Deansboro—The Deansboro Feed & Lumber Co.—woodworking tools and equipment.

N. Y., Forestville—A. E. Dye Milling Co., H. A. Dye, Purch. Agt.—flour and feed grinding, grading, elevating and conveying equipment.

N. Y., Gainesville—The Gainesville Dairymen's League—machinery and equipment also cold storage system for proposed milk pasteurization and bottling plant.

N. Y., Gouverneur—The Gouverneur Limestone Co.—crushing and grinding equipment for the manufacture of agricultural lime.

N. Y., Gouverneur—The International Pulp Co.—talc grinding machinery.

N. Y., Henderson Harbor—The Snow Garage Co., G. Snow, Purch. Agt.—one 2½ ton capacity triplex chain hoist with 300 ft. track and traveler.

N. Y., Jamestown—C. F. Carlson, 19 Norwood Ave.—small blue printing machine.

N. Y., Lackawanna—W. J. Lohr Co., Lehigh Ave. and Ridge Rd.—machinery and equipment for 50 ton daily capacity ice plant.

N. Y., LaSalle—A. LeBar & Sons Co., Belden Ave. and River Rd., A. LeBar, Purch Agt.—machinery and equipment for artificial ice plant, 25 ton per day capacity.

N. Y., Lockport—A. W. Jack Corp.—machinery and equipment for the manufacture of asbestos paper.

N. Y., Lowville—The Bordner Cap Co., manufacturer of pasteboard bottle caps, C. W. Bordner, Purch. Agt.—special automatic machinery for cutting card board discs.

N. Y., Mohawk—The Elizabeth Street Garage—complete battery charging outfit with converter and panel; cylinder grinder (Heald or similar); two ton hoist.

N. Y., Naples—M. J. Maney—machinery for the manufacture of wire handles for grape baskets.

N. Y., Portchester—M. Di Leo, Westchester Ave.—conveying machinery for 300 ton coal bunker.

N. Y., Rochester—A. W. Hopeman & Son, 569 Lyell Ave.—woodworking machinery for proposed furniture factory on Hague St.

N. Y., Rome—The Rome Milk Corp., Inc., W. Murphy, Purch. Agt.—milk handling, pasteurizing and bottle capping machinery and equipment.

N. Y., Watertown—A. M. Osborne, 741 Davidson St.—bread and pastry mixing machinery and baking ovens.

N. Y., Wayland—J. E. Barber—printing press and job equipment.

N. C., Garner—N. L. Broughton Cotton Seed Co.—cotton seed culler.

N. C., Mt. Airy—Jones & Wilson, A. Jones, Purch. Agt.—hand rock crusher to handle about 5 yd. per hr.

N. C., Reidsville—The Amer. Products Corp., B. R. Stone, Mgr.—complete line of bottling machinery and equipment for small plant, including filling, corking and labeling machines, conveyors, etc.

N. C., Rutherfordton—The Taylor Lumber Co., W. C. Taylor, Mgr.—complete line of hand planing mill machinery.

N. C., Thomasville—J. P. Long—machinery and equipment for laundry.

N. C., Waynesville—The Natural Abrasive Mining Co. of America, F. R. Hewitt, Treas.—machinery for proposed grinding mill at Willets.

O., Akron—Brown Graves Co., 85 East Miller Ave.—one veneer jointer to point 86 in. veneers.

O., Cincinnati—The Economy Mchy. Co., 428 East Pearl St., J. Flynn, Sr., Purch. Agt.—double drum double cylinder hoisting engine, 7 in. x 10 in. cylinders.

O., Cincinnati—The Ohio Mchy. Co., 24 West 2nd St.—band saw; saw table; pony planer; jointer; planer and matcher; swing saw.

Pa., Corry—The Corry Jamestown Mfg. Co. (manufacturer of furniture)—several presses, smaller than 30 ton.

Pa., Pittsburgh—The Enterprise Fdry. Co., 1400 Nixon St.—foundry equipment to replace that which was damaged in recent fire.

Pa., Pittsburgh—T. A. North, 825 Maginn Ave., N. S.—woodworking machinery.

Pa., Pittsburgh—The Standard Sanitary Mfg. Co., Preble Ave.—one 60 in. open side planer.

Pa., Pittsburgh—The Pittsburgh Supply Co., Ross St.—two 20 ton overhead cranes.

Pa., Westfield—The Pennsylvania Potash & Fertilizer Co.—machinery for the manufacture of potash-fertilizer. Exclusive rights to the Kreiss process.

S. C., Saluda—R. H. Etheridge, woodworking—knife grinder for planer bits, hand feed, also power feed ripsaw, (used).

S. C., Williston—L. M. Pearson—modern machinery and equipment for creamery.

Tex., Houston—The Worsham Bros. Motor Co., J. H. Worsham, Purch. Agt.—air compressor, 10 hp., power motor, air tank.

Va., Emporia—W. W. Rich—log saw mill complete, (used).

Va., Hopewell—The Hopewell Ice & Cold Storage Co., W. C. Ellis, Mgr.—electrically operated machinery for ice plant.

Va., Lodge—B. B. Dawson—canning machinery and equipment for small plant, (new or used).

Va., Lynchburg—The Texas Arkansas Petroleum Corp., P. O. Box 592, W. W. Hancock, Pres.—well drilling machinery and equipment.

Va., Norfolk—J. B. Porter, P. O. Box 255—various small tools for tinning work, such as shears, cutters, cornice brakes, etc., also about 40 hp. tubular boiler, (used).

Va., Norfolk—The Tidewater Paper Co., Newcastle and Water Sts., R. A. Barrett, Purch. Agt.—one 10 x 15 job printing press, Chandler and Price preferred (used).

Va., Richmond—The Richmond Housing Co., P. O. Box 131—portable saw outfits.

Va., Williamsburg—The Peninsular Dairies, W. Gilley, Secy.—dairy machinery and equipment.

Va., Wytheville—R. P. Johnson, Lumber mill—locomotive dinky engine; conveyor loader for coal, sand, etc., also four side planer and matcher, (used).

Wis., Appleton—H. C. Kattke, 695 Appleton St.—blacksmith shop machinery and equipment.

Wis., Black River Falls—The Vaudreul Wood Products Co., R. Koehler, Purch. Agt.—power saws.

Wis., Eau Claire—The Northwestern Steel & Iron Wks., Spring and Ball Sts.—chain hoist for machine shop.

Wis., Junction City—The Cera Mfg. Co.—planer and saws.

Wis., Marshfield—Blum Bros. Co., 135 West 9th St.—woodworking machinery, power machine, motors, craters, etc., for proposed butter tub factory.

Wis., Marshfield—J. Froelich, Route 5—cheese making machinery, including vats and separator, line shaft drive.

Wis., Mayville—The Peerless Traveling Goods Co.—special machinery for proposed factory on Main St.

Wis., Merrill—Smith Bros. & Kuehl (woodworking), C. Kuehl, Pres.—planers, shapers, band saws and sawing machine.

Wis., Milwaukee—The Ackerman Oil Co., 221 Grand Ave.—gasoline storage tanks and pumps for proposed filling station at Cudahy.

Wis., Milwaukee—The Interior Woodwork Co., 521 Park St.—additional equipment including a motor generator set.

Wis., Milwaukee—The Plymouth Mfg. Co., address M. Mann, Plymouth, Wis.—machinery for the manufacture of dress goods, etc.

Wis., Milwaukee—W. J. Raley, 711 Chestnut St.—gas storage tank and pump.

Wis., Watertown—J. J. Locklin, 630 West Main St.—milk handling, pasteurizing and bottling equipment.

Wis., Waupon—C. A. Shaler Co.—special machinery and power machinery for vulcanizing plant.

Ont., St. Thomas—The St. Thomas Packing Co., W. H. Moody, Mgr.—materials and equipment for proposed cold storage plant.

Ont., Strathroy—The Butler Woolen Mills—woolen mill equipment.

Metal Working Shops

Conn., Bridgeport—The Bridgeport Auto Co., Inc., 386 Fairfield Ave., plans to build a 2 story service station on Courtland St. Estimated cost, $40,000. Architect not selected.

Cal., Los Angeles—E. A. Gray Co., 510 South San Pedro St., has awarded the contract for the construction of a 1 story machine shop. Estimated cost, $40,000.

Cal., Oakland—The Walnut Grove Creamery, 41st and Market Sts., has awarded the contract for the construction of a 2 story blacksmith shop on 41st and Market Sts. Estimated cost, $5,000.

Cal., San Pedro—The Regan Forge Co. has awarded the contract for the construction of a 1 story, 80 x 200 ft. foundry and machine shop. Estimated cost, $60,000.

Cal., Tranquility—The Tranquility Union High School Dist. is having plans prepared for the construction of various school buildings, including machine shop, farm mechanics building, etc. E. J. Kump, Rowell Bldg., Fresno, Archt.

Ill., Chicago—Z. E. Smith, Archt., 305 East 55th St., is receiving bids for the construction of a 2 story, 50 x 50 ft. factory at 414 East 34th St., for the Chicago Wheel & Spring Co. Estimated cost, $25,000.

Ill., Highland Park—Holmes & Flinn, Archts., 8 South Dearborn St., Chicago, are receiving bids for the construction of a 1 story, 50 x 140 ft. garage and auto repair shop on Laurel and 1st Sts., for G. H. Koon, 47 South St. John St. Estimated cost, $40,000.

Ill., Joliet—The Goodspeed Bros. Auto Co. plans to build a 1 story, 60 x 150 ft. garage. Estimated cost, $40,000. Architect not selected.

Ky., Central City—The Triangle Machine Wks., Central City, will build a 2 story, 75 x 100 ft. machine shop. Estimated cost, $25,000.

Mass., South Boston (Boston P. O.)—The National Can Co., Locust St., has had plans prepared for the construction of a 2 story, 92 x 160 ft. manufacturing building, 1 story, 20 x 60 ft. garage and a 3 story, 20 x 40 ft. storage building. Estimated cost, $125,000. A. A. Browne, 7 State St., Boston, Archt.

N. J., Atlantic City—The Union Transfer Co., 1004 Spring Garden St., Phila., has awarded the contract for the construction of a 1 story, 45 x 55 ft. and 105 x 165 ft. garage at 110-6 North Virginia Ave., here. Estimated cost $100,000. Noted Sept. 29.

N. J., Trenton—The Crescent Insulated Wire & Cable Co., Taylor and Olden Sts., has awarded the contract for the construction of a 2 story, 75 x 240 ft. and a 3 story, 60 x 120 ft. factory on Taylor St. Estimated cost, $50,000.

N. Y., Baldwinsville—C. L. Cadle, Supt. Pub. Wks., Albany, plans to build a barge canal repair plant, here. Estimated cost, $100,000. L. F. Pilcher, Albany, State Archt.

N. Y., Rochester—B. G. Costich, 251 Hayward Ave., plans to build a 50 x 146 ft. garage on Hayward Ave. Estimated cost, $40,000.

N. Y., Syracuse — The Franklin Automobile Co., 302 South Geddes St., plans to build an automobile factory. H. H. Franklin, Pres.

O., Cleveland—The Dille Mfg. Co., 684 East 82nd St., manufacturer of hardware, has awarded the contract for the construction of a 1 story, 45 x 75 ft. addition to its factory. Estimated cost, $40,000.

Ore., Portland — The Oregon Coal Co. plans to build 1 story blast furnaces. Estimated cost, $500,000. A. G. McKee Co., 2422 Euclid Ave., Cleveland, O., Archt. and Engr.

Pa., Derry—The Pittsburgh High Voltage Insulator Co. has awarded the contract for the construction of a 1 story, 93 x 160 ft. factory. Estimated cost, $80,000.

Pa., Kane—The McKean Chemical Co., Dahoga, plans to build a 2 story, 80 x 250 ft. chemical plant here. Estimated cost, $80,000. N. B. Bubb, Williamsport, Secy., Treas. and Mgr.

Pa., Phila.—The International Harvester Co. of America, 21 North 23rd St., is receiving bids for the construction of a 5 story, 100 x 130 ft. warehouse and a 1 story, 64 x 100 x 140 ft. service station on 16th St. and Indiana Ave. Estimated cost, $500,000. W. D. Price, 5408 North Central Ave., Chicago, Engr.

Wis., Beloit—J. T. Hetherington & Son, Archts., 38 South Dearborn St., Chicago, will soon receive bids for the construction of a 2 story, 100 x 130 ft. factory on Broad St., for J. H. Saris, 412 Broad St. (manufacturer of automobiles). Estimated cost, $75,000.

Wis., Madison—W. F. Clark, 2105 Keyes Ave., is having plans prepared for the construction of a 1 story, 60 x 186 ft. garage and filling station on University St. Estimated cost, $45,000. A. E. Small, Ellsworth Bldg., Archt.

Wis., Milwaukee — W. J. Raley, 711 Chestnut St., is having plans prepared for the construction of a 2 story, 30 x 150 ft. garage on chestnut St. Estimated cost, $40,000. Private plans.

Wis., Sparta—F. J. Domke plans to build a 2 story, 32 x 100 ft. garage on South Water St. Estimated cost, $50,000. Architect not selected.

Wis., Waupun — C. A. Shaler Co. has awarded the contract for the construction of a 2 story, 75 x 110 ft. vulcanizing plant. Estimated cost, $55,000.

Ont., Sarnia—The Dominion Alloy Steel Corp., Sarnia, plans to build a steel plant on St. Clair St. Estimated cost, $3,000,000. C. H. Wills, Marysville, Mich., interested. J. J. Mahon, c/o owner, Engr.

Ont., St. Thomas—The City Council is having plans prepared for the construction of a repair shop and gasoline station in connection with the new civic auto bus line. Estimated cost, $15,000. A. Miller, City Engr.

Ont., Welland—The Highway Crossings, Ltd., manufacturer of steel railway crossing signs, has purchased a 100 x 500 ft. site in Maple Leaf Park and plans to build a factory.

General Manufacturing

N. Y., Gainesville—The Gainesville Dairymen's League plans to build and equip a milk pasteurization and bottling plant. Estimated cost, between $40,000 and $50,000.

N. Y., Lackawanna (Buffalo P. O.)—W. J. Lohr, 311 Ridge Ave., plans to build a 25 ton ice plant on Lehigh Ave. Estimated cost, $62,000.

N. Y., Rochester—The Bartholomay Co., Inc., 555 St. Paul St., manufacturer of ice cream, plans to build a 4 story, 50 x 80 ft. addition to its factory. Estimated cost, $15,000.

N. Y., Rochester—A. W. Hopeman & Son, 569 Lyell Ave., plans to build a 67 x 154 ft. furniture factory on Hague St. Estimated cost, $30,000.

N. Y., Rochester—C. W. Oster, 346 East Main St., plans to build a printshop at 807 Lake Ave. Estimated cost, $8,000.

N. Y., Rochester—The Rochester Printing Co., 61 Main St., E., plans to remodel and build an addition to its plant. Estimated cost, $50,000.

N. Y., Rochester — Sampson-Wohlrab Packing Co., Buffalo Rd., plans to build a 3 story, 44 x 108 ft. refrigerator plant on Kerr St. and Field Rd. Estimated cost, $18,000.

N. C., Willets—The Natural Abrasive Mining Co. of America, Waynesville, plans to build a grinding mill, here. Estimated cost, $250,000. Address F. R. Hewitt, Waynesville, Treas.

O., Cleveland—The Euclid Ave. Lumber Co., 11715 Euclid Ave., has had plans prepared for the construction of a 1 story lumber yard, including a garage, at 11615 Mayfield Rd. Estimated cost, $40,000. Private plans.

O., Cleveland — The Penton Publishing Co., East 12th St. and Chestnut Ave., is having plans prepared for the construction of a 9 story, 135 x 135 ft. publishing plant on West 3rd St. and Lakeside Ave. Estimated cost, $500,000. R. E. Power, Treas. F. Chase, 645 North Michigan Ave., Chicago, Archt.

Pa., Bethlehem—R. K. Laros Silk Co., 9th and Linden Sts., has awarded the contract for the construction of a 3 story, 60 x 240 ft. silk factory. Estimated cost, $130,000.

Pa., McKeesport — The Peters Packing Co., Inc., has awarded the contract for altering and building an addition to its plant. Estimated cost, $100,000.

Pa., New Castle—The Wear Well Tire Co. is having plans prepared for the construction of a 1 story, 50 x 150 ft. tire factory and a 14 x 50 ft. office. Estimated cost, $50,000. Earl & Altschuler, Dean Bldg., Archts.

Pa., Phila.—The Alva Carpet & Rug Co. has awarded the contract for the construction of a 3 story, 50 x 150 ft. carpet mill on Kinsey and Hedge Aves. Estimated cost, $100,000.

Pa., Phila.—The McCallum Silk Hosiery Co., 377 Dwight St., Northampton, Mass., has awarded the contract for the construction of a 3 story, 85 x 174 ft. hosiery mill on Roosevelt Blvd. and 2nd St. here. Estimated cost, $90,000.

Pa., Phila. — Montgomery Bros., Inc., have awarded the contract for the construction of a 2 story, 27 x 70 ft. addition to packing and rubber goods factory on Penrose and Parker Sts. Estimated cost, $7,500.

Pa., Phila. — The N. E. Ice Mfg. Co., Front and Luray Sts., has awarded the contract for the construction of a 1 story, 72 x 115 ft. and 1 story, 43 x 105 ft. ice manufacturing plant on Front and Luray Sts.

Pa., Pittsburgh—The Hardie Bros., 1601 Liberty Ave., are having preliminary sketches made for a 5 story, 135 x 350 ft. candy factory on Pike and 13th Sts. Estimated cost, $150,000. J. L. Beatty, Jackson Bldg., Archt.

Pa., Shamokin—The Croninger Packing Co. plans to build a 5 story, 40 x 75 ft. packing plant. Estimated cost, $150,000. W. H. Lee, 32 South 17th St., Phila., Archt.

Pa., Watsontown—The Watsontown Sash & Door Co. plans to build a factory to replace the one destroyed by fire. Estimated cost, $150,000.

R. I., Providence—The Colwell Worsted Mills, 204 Hartford Ave., has awarded the contract for the construction of additions to its plant, including a 2 story, 55 x 200 ft. mill; a 1 story, 46 x 80 ft. dye house; 1 story, 45 x 60 ft. boiler house; 1 story, 25 x 45 ft. machine shop, and 1 story, 35 x 45 ft. shipping building. Estimated cost, $150,000.

R. I., Westerly—The Westerly Textile Co., 41 Main St., has awarded the contract for the construction of a 5 story, 32 x 50 ft. addition to its mill. Estimated cost, $50,000.

Tex., Hoskins Mound — The Freeport Sulphur Co. of Freeport, Tex., has awarded the contract for the construction of a complete sulphur mining plant here.

Va., Hopewell — The Hopewell Ice & Cold Storage Co. is having preliminary plans prepared for the construction of a 1 story, 25 x 100 ft. ice plant. Estimated cost between $40,000 and $50,000. W. C. Ellis, Mgr.

W. Va., Richwood—J. L. Horner Ice Co., Clarkesburg, plans to build a 10 ton ice plant here.

Wis., Cudahy—The Ackerman Oil Co., 221 Grand Ave., Milwaukee, has awarded the contract for the construction of a 2 story, 40 x 60 ft. warehouse and a 1 story, 12 x 20 ft. filling station, here. Estimated cost, $40,000.

Wis., Elkhorn—F. J. Schmidt plans to build a 2 story, 50 x 75 ft. ice cream factory. Estimated cost, $35,000. Architect not selected.

Wis., Madison—The Pennsylvania Oil Co., 731 East Washington St., has purchased a site on Dayton St. and plans to build a 2 story, 50 x 95 ft. oil warehouse, etc. Estimated cost, between $40,000 and $50,000. Architect not selected.

Wis., Manitowoc—A. M. Richter Sons Co., South 8th and Madison Sts., is having plans prepared for the construction of a 3 story, 70 x 82 ft. cider vinegar plant on South 9th and Grand Sts. Estimated cost, $65,000. L. I. Pentizien, Savings Bank Bldg., Archt.

Wis., Marshfield—Blum Bros. Co., 135 West 9th St., will open bids about May 1 for the construction of a 1 and 2 story, 96 x 120 ft. buttertub factory. Estimated cost, $100,000. G. A. Krasin, Marshfield, Archt.

Wis., Mayville—J. E. Hennen, Archt., 74 South Main St., Fond-du-Lac, will receive bids until April 20 for the construction of a 2 story, 50 x 90 ft. factory on Main St., for the Peerless Traveling Goods Co. Estimated cost, $50,000.

Wis., Milwaukee—The Quality Dairy Co., 2347 Hadley St., is having plans prepared for the construction of a 2 story, 46 x 80 ft. addition to its dairy on Burleigh St. Estimated cost, $20,000. H. W. Voelz, 86 Michigan St., Archt.

Wis., Oshkosh—The Mercy Hospital, 185 Hazel St., is having revised plans prepared for the construction of a 2 story, 40 x 70 ft. boiler house and laundry and a 3 story, 42 x 100 ft. convent. Estimated cost, $175,000. E. Brielmaier & Sons, 432 Bway., Milwaukee, Archts.

Wis., Park Falls—The Flambeau Paper Co. is having plans prepared for the construction of a 2 story, 75 x150 ft. wood mill. Estimated cost, $100,000. T. W. Orbison, 812 College Ave., Appelton, Archt.

Ont., Barry's Bay—Murray & Omanique plan to build a pulp grinding plant. Estimated cost, $150,000. Architect not selected.

Ont., Bridgeburg—The St. Thomas Packing Co. plans to build a cold storage packing plant in Crowland Sect. Estimated cost, $50,000. Private plans.

Ont., Ottawa—Swifts Canadian Packing Co., Ward Market, has awarded the contract for the construction of a 1 story, 50 x 100 ft. cooling plant. Estimated cost, $18,000.

Ont., Strathroy—The Butler Woolen Mills plans to rebuild plant which was partially destroyed by fire. Estimated cost, $25,000.

Ont., St. Thomas—The St. Thomas Packing Co. is having plans prepared for the construction of a cold storage plant. Estimated cost, $50,000. W. H. Moody, Mgr.

Ont., Toronto—The Lawrason Doughty Co., 42 Church St., plans to build a 2 story, 45 x 110 ft. printing plant on Hamilton St. Estimated cost, $25,000. Architect not selected.

Ont., Welland—The Universal Casket Co. plans to build a factory in Maple Leaf Park. Estimated cost, $40,000. B. A. Basque, Pres. Architect not announced.

Ont., Wiarton—The Kastner Lumber Co. plans to build saw mills to replace the ones destroyed by fire. Estimated cost $35,000.

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American Machinist

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JAMES H. McGRAW, President — ARTHUR J. BALDWIN, Vice-President — MALCOLM MUIR, Vice-President — EDWARD D. CONKLIN, Vice-President — JAMES H. McGRAW, JR, Secretary and Treasurer

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ALL AGREEMENTS MADE SUBJECT TO STRIKES, FIRES AND OTHER CAUSES OF DELAY BEYOND OUR CONTROL

Oct. 12, 1921

Mr. Mason Britton, General Manager,
American Machinist,
Tenth Avenue at 36th Street,
New York City.

Dear Sir:-

The American Machinist is the oldest paper in its field, and has preserved for forty-four years an unbroken record of service to the machine tool builder and user. It is our experience that this service is increasingly effective, and that its columns reach all the ramifications of the business in which we are interested.

From the advertising standpoint, it is particularly adapted to the promulgation of a definite and aggressive advertising policy, based on the frequent presentation of continuously changing, but carefully prepared copy.

No one who is looking for an engineering and business success in the machine tool field can afford to neglect it.

Yours very truly,

JONES & LAMSON MACHINE CO.
Ralph E. Flanders
Manager

EFN

577

American Machinist

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Methods of Machine Tool Design

Usual Machine Design Methods Do Not Always Apply in Designing Machine Tools—Definition, Classification and Requirements of a Machine Tool

By A. L. DeLEEUW

THERE are many books in existence dealing with the design of machinery in general. As a rule such books treat mostly, if not exclusively, of the design of machine elements, such as bearings, shafts, keys and clutches, connecting rods and valves, or gears and cams and pulleys. Others again deal with the complete design of certain classes of machinery, such as generators, or steam engines, or turbines, or hydraulic machinery.

Having thoroughly absorbed the substance of one of this latter class of books the reader would be able to design some such machine himself and, though that machine might not be the best ever designed, yet it would contain all that is necessary to give it a certain amount of success. There are also books which deal exclusively with the design of machine tools, but they differ from the second class which was mentioned above in so far that the student, after thoroughly absorbing the contents of such a work would yet not be able himself to design a machine tool.

In the following pages an attempt will be made to describe the processes through which the designer should go when designing a machine tool. It will be taken for granted that he has the necessary knowledge of the design of machine elements or, at least, that he knows how and where to get it.

It might appear that the rules which hold good for the design of any other kind of machine should also be applicable to machine tool design; but as a matter of fact there is a great difference in the processes involved when designing a steam engine or generator or boiler, and those used when designing a machine tool. One of the main reasons is that there are no well-established data from which to start.

Designing a steam engine we start with the amount of power to be developed and we know which well-known elements we should use to obtain the desired result. We have a general picture of the machine we are going to develop and we know the order in which the details must be taken up. All the problems which come up in the design of a steam engine have been studied separately and the results have been placed on record. To design a steam engine of given horsepower our first question is: What is the pressure of the steam? We then decide what cut-off we shall use and from this we determine the mean effective pressure. We select the length of stroke and we will be guided by considerations which the problem has brought before us. Having mean effective pressure and length of stroke, we can at once determine the diameter of the cylinder. We can now check up diameter and length of stroke in relation to each other and, if necessary, modify our first choice. Knowing the cut-off at which we wish to operate, we can lay out the valve motion. In this manner the various elements of the steam engine are brought together and put into concrete form step by step. The same general method holds good for many other classes of machinery, but not for machine tools. As was said before, there are no well established data available.

> BOOKS TELLING in detail how to design engines, generators, hydraulic machinery, etc., are ready to the hand of the designer. When he tackles a machine tool, however, there is nothing of the sort available and the problem is a much more difficult one, besides.
>
> Each design has its own peculiar difficulties and in addition the difficulties inherent in its type, whether it be a standard or single-purpose machine.
>
> Nevertheless, it is quite possible to employ systematic methods in tackling each individual case. The development of such methods by one of our best machine tool engineers is the purpose of this and succeeding articles.

Besides, there are other reasons. A number of elements which do not enter into the design of most classes of machinery are of great importance in the design of a machine tool, and even such elements as are common to the machine tool and other classes of machines are of different relative importance in machine tool design. To illustrate this latter statement: One of the great elements in the design of a steam engine—economy of power—is a minor consideration in the design of machine tools. We are perfectly willing to spend a few extra horsepower if, on the other hand, we can obtain economy of production—a factor which does not exist in the steam engine. Such elements as handiness, accessibility, freedom from vibration, provision for taking up wear, etc., are of the greatest importance in machine tool design, though of secondary importance only in the design of most other classes of machines.

Not only do we lack fundamental data, but our requirements are never definitely stated. In designing

a steam engine we know exactly what strains the various parts of the engine must resist and we can build accordingly. The strains in the engine never exceed a well-known maximum and depend entirely on horsepower and speed. In a machine tool the strains to which the machine is subjected depend, it is true, on the nature of the material to be cut and on the size of cut, but they depend also on a number of other things such as the shape of the tool and the degree of sharpness to which it is ground. A machine tool may from day to day or, for that matter, from hour to hour, take entirely different cuts with entirely different tools and in entirely different materials. There is no positive limit as to the amount of power which must be transmitted by the mechanism of the machine. If the machine is designed for a 6-in. belt and the user finds that he does not have enough power to take the cut he wants to take, he tightens the belt; or, if he has a motor drive, he substitutes a larger motor. Neither the designer nor the builder is consulted in this matter. After the machine tool leaves the hands of the manufacturer it gets into the hands of somebody who is concerned with one consideration only, and that is how to get the greatest amount of production out of that machine. The user of a steam engine would not dare to double its speed, for the flywheel might burst; the user of a boiler does not dare to increase the steam pressure, for the boiler might blow up; the user of a dynamo or motor does not dare to increase the wattage, for the insulation would burn out; but the user of a machine tool is not limited in any sense and may keep on imposing heavier and heavier duty on the machine until it breaks down, and then he blames either the manufacturer or the designer or both.

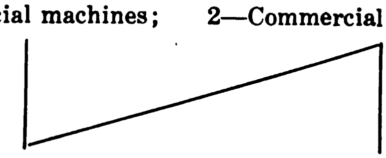
As a result of this lack of definite information and definite aim, machine tool design has depended almost exclusively on slow evolution. It has been almost entirely in the hands of men who were familiar more with the art of running the machine than with the art of originating it. During a period of many years a certain amount of knowledge has been accumulated and has been transmitted more or less by word of mouth from one generation to another. Most designers when dealing with the design of machine tools have a fairly clear idea as to the requirements of the machine they are to design, but it is doubtful if many have considered the order of importance of these requirements.

Classification of Machine Tools

Machine tools might be divided into two classes, special machines and commercial machines. Though there is little difference in mechanical requirements of these two classes there is a great difference in the relative importance of these requirements. For example, the chief requirement of any special machine is that it shall do properly the work it is intended to do. Though this also is one of the main requirements of a commercial machine, it is not the chief one. The chief requirement of a commercial machine is that it shall be marketable at a profit and as, of course, it cannot be marketable unless it fulfills its duty, it must also be suitable to the purpose for which it is built. As a result, it is not so essential that one should carefully consider the cost of manufacture of every detail of a special machine. On the other hand, as a special machine is made for one purpose only, and as that purpose is definitely known, it *is* of the greatest importance that it shall be as economical—that is, as productive—in its operation as it is possible to make it. Though this same thing is desirable, again, for a commercial machine, it is absolutely impossible to make it the main feature for all the kinds of work that might be done on it. It stands to reason that a 36-in. lathe can never be so productive for the turning of a ½-in. shaft as a 10-in. lathe can be; nor can the 10-in. lathe ever be so productive for a 7-in. shaft as the 36-in. lathe can be.

There is a class of commercial machine tools which is built for one purpose only—the single purpose machines. We might, therefore, divide machine tools as follows:

1—Special machines; 2—Commercial machines:



2a—Single purpose machines; 2b—General utility machines.

The class 2a does not offer as many difficulties to the designer as 2b, but he has still to reckon with the requirements of economy of manufacture, which is one of great importance in all commercial machines.

Requirements of Machine Tools

The chief requirements of any machine tool whether special or commercial, are the following:

(1) It must function properly.

(2) It must have the necessary strength.

(3) It must have the necessary rigidity.

(4) It must have the necessary power for the cuts intended.

(5) It must have the necessary feeds and speeds for the range of work and cutting speeds which might be handled on a machine of this type.

(6) Parts must be so proportioned as to hold wear down to a minimum.

(7) Provision must be made for the taking-up of wear which may affect the accuracy of the product.

(8) All take-ups, adjustments and parts liable to breakage must be easily accessible.

(9) The machine must be so constructed as to allow of ready repair. In other words, it must be easily assembled and disassembled.

(10) Parts should be so designed as to allow of economical manufacture.

(11) The machine must be easy to operate.

(12) The machine should have a pleasing appearance.

(13) It should be possible to handle and ship the machine by proper means without danger of breakage or distortion.

Many other minor requirements might be mentioned, but the requirements given above will give sufficient material for the following articles, and will bring up naturally those requirements not mentioned here.

As to the order of their importance, there might be some discussion in regard to some of them, but this much is sure: that number one will have to stay in its place, as meeting all the other requirements is of no benefit unless the first requirement is met—that is, unless the machine functions properly.

For the purpose of the subsequent discussions we will give the following definition of a machine tool:

A Machine Tool is a Metal Working Machine for the Removal of Material from a Piece of Work and Containing Means for Holding, Guiding and Controlling the Work, or Tool, or Both.

A machine tool is therefore an organization composed of a number of elements which in themselves may be organizations, and of which each element has to be capable of performing a certain function. There must be a mechanism, there must be means for holding the work, means for holding the tool, means for guiding either or both, and means for controlling the various movements and conditions. It may be that the same parts are used for more than one function; in fact, this is almost always so. But for the purpose of design we should keep the functions apart. The table of a milling machine guides the work and it also has means for holding it—the T slots. Similarly, the carriage and slides of a lathe or saddles of a planer are the elements for guiding and holding the tool. However, for the purpose of design we consider *one function* at a time.

Designing a Machine

When starting the design of a machine we have nothing before us but a drawing board and some instruments, or perhaps a sketch pad and a pencil. Of course there are cases when a manufacturer takes an existing machine and modifies it and calls the result a new design; and so it is, as far as the trade is concerned. But to the designer it is merely an alteration; or, in other words, the problem of designing a part of a machine. We are concerned here with designing "from the ground up."

To try to build up from this zero condition to the complete machine is very much like trying to build up a pyramid standing on its apex. We should start in with the finished machine, and we should imagine that this machine has been completely designed and will do the work for which it is intended. We then analyze this imaginary machine and find what main units are required to build it.

We should follow very much the same method as we employ when looking up railroad connections if we wish to be at a given place and at a definite time. The man in Philadelphia who has to meet an appointment in Milwaukee at a given day and hour does not start looking up the various trains he can take out of Philadelphia. Rather he looks up the various trains which would bring him in Milwaukee at the proper hour, and he finds that in order to meet his demands he must take a train from Chicago at a certain time. Then he works back, finding a train which will bring him to Chicago at such a time as will enable him to make connections for Milwaukee. There may be various combinations which will fill his requirements. He compares these combinations and selects the simplest, or quickest, or cheapest, or the one with the most agreeable scenery, or possibly the one which gives the best sleeping- and dining-car service—all according to what he wishes to accomplish on his trip. After he has determined in a general way which road he will take, he goes into details.

Analogies are never quite correct and this is a case in point. When we look up railroad trains we merely make a selection of existing conditions; but when we design an entirely new machine we have, as a rule, no existing functional units to choose from. On the other hand, this is not necessary for our first plans. We simply take for granted that in some way we will provide the functional units on which we have based our general plan.

Romances of Metal Working—The Story of Hal of the Wind

By H. H. Manchester

Hal of the Wind, as the legend ran, was a smith and armorer of Perth, Scotland, about 1400 A. D. in the reign of Robert III of Scotland.

On the morning of St. Valentine's day, he was kissed in his sleep by the beautiful Catherine Glover, who thus chose him to be her valentine for the ensuing year. Not long after this, however, Prince James placed Louise, the French glee maiden in his charge, which caused an estrangement between him and Catherine, and greatly increased the chances of Eachin, a young chieftain of the clan Quhele.

HAL OF THE WIND AT WORK

In the meantime, Hal, who was also known as Henry Smith from his occupation, and Henry Gow from his personal characteristics, was busily making armor for the courtiers and the clansmen. In fact, it was said that no smith in Scotland could duplicate a piece of Italian armor but him.

The feud between the clan Quhele and the clan Chattan finally became so bitter that the king authorized a tournament to the death on the plain at North Inch, near Perth, between the two clans. When the clans assembled, it was discovered that one of the representatives of the clan Chattan was not present, and although Henry Smith was a member of neither clan, he offered to fight in place of the missing warrior.

In the fight which followed, Hal of the Wind did prodigies of strength and valor, while the armor which he himself wrought stood up against every assault. The outcome of the fight was that the clan Quhele was practically wiped out by the death of some thirty of its strongest men, while Eachin alone escaped to either exile or suicide.

Smith was offered a knighthood but refused. Soon afterward he married Catherine, and many families are proud to trace their ancestry to him, while his story is enlarged upon in Walter Scott's "Fair Maid of Perth." The prevalence of the modern name Smith is good proof of the number and importance of the Smiths in Mediaeval times. As run the old verses:

"From whence came Smith,
Albe he knight or squire,
But from the smith
That forgeth at the fire?"

The Assembling of Bevel Gears

Adjustment of Pinion and Adjustment of Gear Produce Different Results—Gears Should Be Cut with Allowance for Backlash—Bottoming of Teeth

BY CHARLES H. LOGUE

THE present object is to furnish simple comprehensive instructions for the proper assembly of bevel drive gears for automobiles. A special endeavor has been made to avoid technicalities and to present the entire matter as simply as possible.

It is impossible to assemble a pair of spur gears incorrectly providing the shafts are parallel, but unfortunately this is not the case as regards bevel gears. With spur gears it is simply a matter of securing the engagement of cylindrical pitch surfaces, which automatically adjust themselves to any position in which the gears are placed. So long as spur gears may be freely operated their action will be correct, providing, of course, that they are correctly cut.

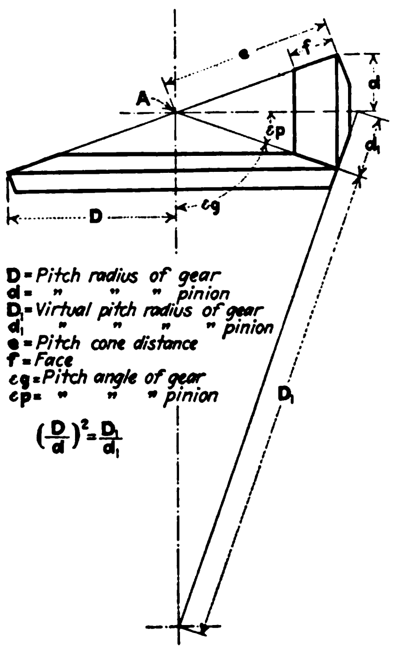


FIG. 1. PITCH SURFACES OF BEVEL GEARS

In bevel gears the pitch surfaces are conical and it is necessary that the apex of each cone coincide with the intersection of the gear and pinion axis. (See point *A*, Fig. 1.) Adjusting facilities are simply for the purpose of securing this intersection, the correction of which is evidenced by the bearing on the length and profile of the teeth, as will be explained. Gears do not require adjustment to compensate for wear, so a correct position once attained should never be altered.

It is apparent that the pitch of a bevel gear varies throughout the entire length of the face; we have, say—four pitch at the large end and five pitch at the small end of the tooth. Quiet, efficient operation requires, first of all, the engagement of equal pitches. Flush engagement at the large ends of the tooth does not necessarily mean the engagement of equal pitches on account of variations in machining of the gear blanks and to varying amounts of distortions in hardening; engagements at small ends are still less dependable on account of variation in length of face. An approximation of the correct position, so far as the relation of ends of teeth are concerned, may be found by rolling the pinion in the gear by hand.

The only real determination of this requisite engagement is by means of the tooth bearing, which may be seen by painting the teeth with a mixture of red lead and oil and running the gears under load. This bearing will occur across certain prescribed portions of the teeth of both gear and pinion and when found as described is positive evidence of proper tooth engagement. For instance, in case the bearing falls too low on the profile of the *gear* teeth it is evident that the pitch of the gear, as engaged, is less than the pitch of the pinion, therefore, the pinion is too far in towards the gear. Should the bearing on the gear teeth run high, the pinion is too far out, away from the gear. A movement of the gear toward or away from the pinion has the opposite effect, but to a decidedly less extent. By referring to Figs. 2 and 3 the relative change in pitch engagement will be apparent. Moving the pinion changes the backlash and consequent bearing along the teeth but slowly as compared to a gear movement, as will be apparent from a study of Fig. 3 so that for all practical purposes we may say that *the position of the gear controls the bearing along the length of the teeth and that the pinion position controls the bearing on the profile or height of the teeth.* Of course, in case the pinion is moved any great distance the bearing along the teeth will also change and must be corrected by re-adjusting the gear. Also any decided change in length of bearing necessitates a new pinion position. The pinion for a ratio of 5 to 1 for instance, may be moved five times as far as the gear for a given change in backlash and the gear moved five times as far as the pinion to bring about a corresponding change in profile bearing.

Equal pitches are engaged when the bearing on the profile of *pinion teeth* extends across its entire working

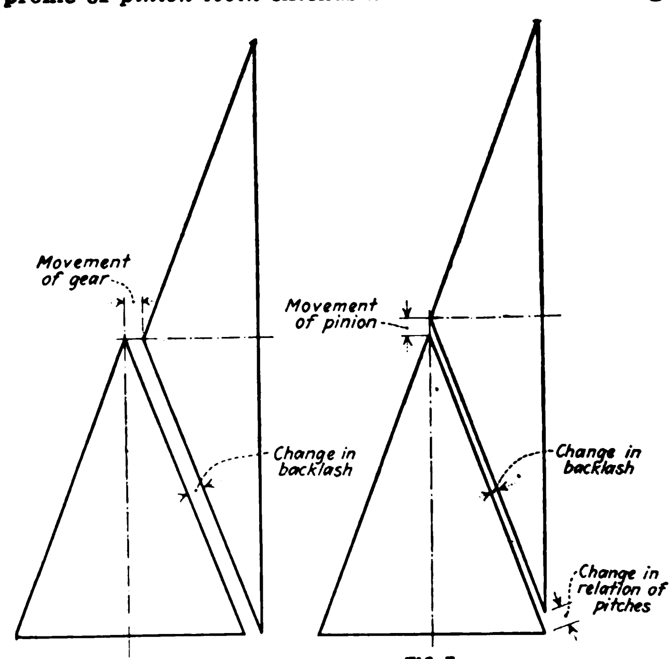
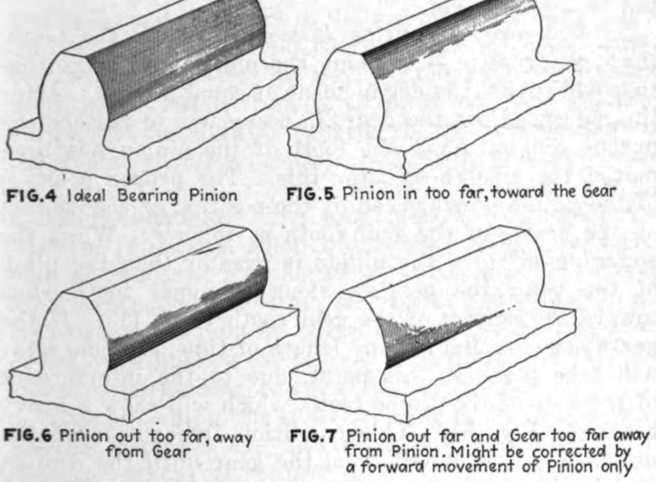


FIG. 2. EFFECT OF GEAR ADJUSTMENT. FIG. 3. EFFECT OF PINION ADJUSTMENT

height from the base line, where the involute curve stops, to the top of the tooth as illustrated by Fig. 4. A bearing heavy on the top (Fig. 5) means that the

pinion is too far forward, toward the gear. A bearing, heavy in flank (Fig. 6) means that the pinion is too far out, away from the gear. Do not attempt to correct bearing along the *length* of tooth by moving the pinion, although in case the bearing is low as shown (Fig. 6) at the same time slightly heavy at the large end of tooth, as in Fig. 7, a forward movement of the pinion might correct both conditions.

Unfortunately, however, it is usually difficult to see the pinion bearing owing to axle construction, so our main dependence must be placed on the bearing which appears on the teeth of the gear. The position of the bearing on the profile of the gear tooth does not extend its full depth and in many cases does not reach the tops



FIGS. 4 TO 7. BEARING ON PINION TEETH

of the teeth so that its proper position is more difficult to explain than that for the pinion.

The introduction states that technicalities are avoided, but in order to offer a satisfactory explanation of general statements as to gear tooth contact as will be outlined, it is necessary to enter a little into the theory of tooth action for the benefit of those interested. Others may skip this portion and take statements made for granted. Fig. 8 illustrates the engagement of bevel gear and pinion, as developed upon their virtual pitch radii. This engagement is shown at three periods—that is, *e* at the point where gear tooth first engages that of the pinion, *g* at the pitch point and *n* as the gear tooth is about to leave pinion tooth at the end of the arc of contact.

Contact cannot occur on the profile of the gear tooth beyond the intersection of the pinion base circle and the line of action, or point *e*. Any portion of the gear tooth extending beyond this point will not show contact, as is in this case evidenced by the distance *f*. That is, the contact on profile will fall this distance below the tops of the gear teeth.

The theoretical height of bearing, above the pitch line, is equal to the pitch radius times $\sec^2$ of the pitch angle times $\sin^2$ of the angle of virtual obliquity. The difference between the addendum, as employed, and the bearing height found as above, represents the distance which bearings will fall below the tops of the teeth. In case the addendum is equal or is less than this amount the bearings should extend clear to the tops of the gear teeth. Contact at *g* being reached the path of the contact on the gear tooth now extends from the point *e* to the pitch line, or the distance *h*. At the end of the engagement the pinion tooth breaks contact with the gear tooth at *n* and the entire path of this contact will be found in the distance *k*. This path of contact should show on the painted surface of the gear tooth.

It is necessary to explain, in this connection, that the contact between gear and pinion tooth is constantly along the line of action. The angle of approach cannot be greater than the angle of virtual obliquity as shown in Fig. 8, so that the bearing above the pitch line of the gear can not extend beyond the point *e* as stated. The angle of recess and consequent depth of gear tooth engagement, below pitch line, is dependent upon pinion addendum. The pinion diameter and obliquity of action affect both of these dimensions.

The point to be derived from this explanation is that the position of bearing is dependable measurement of the accuracy of tooth action—therefore, a proper guide for gear and pinion location. When the bearing is correct the gears are at their best, it is only necessary to know where the bearing should come.

Usual Position of Bearing on Gear Tooth

According to ordinary practice in all straight tooth bevel gears the bearing will fall about $\frac{1}{32}$ in. below tops of the gear teeth. In spiral bevels the bearings will usually extend clear to the tops of the teeth. This is on account of the proportionate gear addendum usually employed for these types. The depth of bearing below pitch line may be readily determined by moving the pinion a little forward, toward the gear, and noting its position. This bearing never goes the full working depth. A study of Fig. 8 will explain this.

A bearing extending from the lowest point (as may be found by moving the pinion slightly forward) to the tops of the gear teeth means a perfect form in both gear and pinion. It is only reasonable to assume therefore that the bearing will often come narrower on some gears than on others as perfection in tooth form is not to be expected. In cases where it is impossible to show

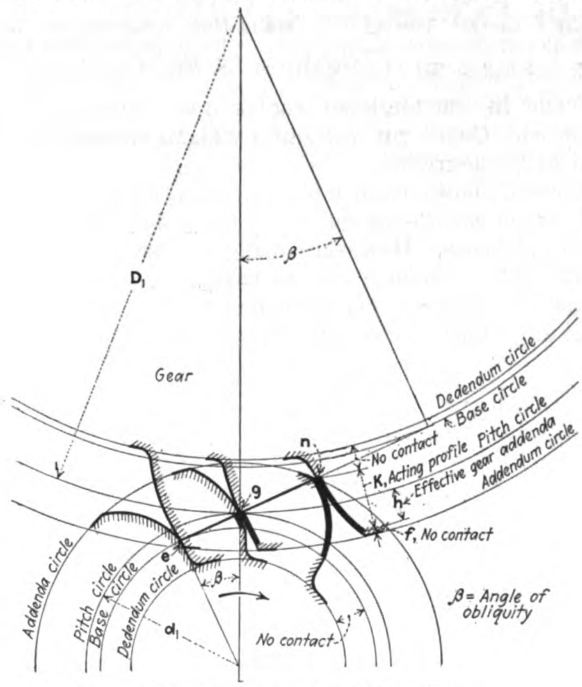


FIG. 8. PATH OF CONTACT

a bearing from the low point (found by a forward pinion movement) to the tops of the teeth, the best plan is to place this bearing in spiral gears so that it will

extend from the tops of the gears to the lowest possible point, that is—let the bearing tend to run high rather than low.

In straight tooth gears let the bearing begin about $\frac{1}{16}$ in. from the tops of the teeth and extend down the tooth as far from this as is possible. In other words for both spiral and straight tooth gears, be sure that the main section of bearing falls across the pitch line.

Bevel gears are properly generated upon the principle that whatever backlash is to be allowed in their operation must be provided for in cutting the teeth and that this backlash cannot be altered unless a change

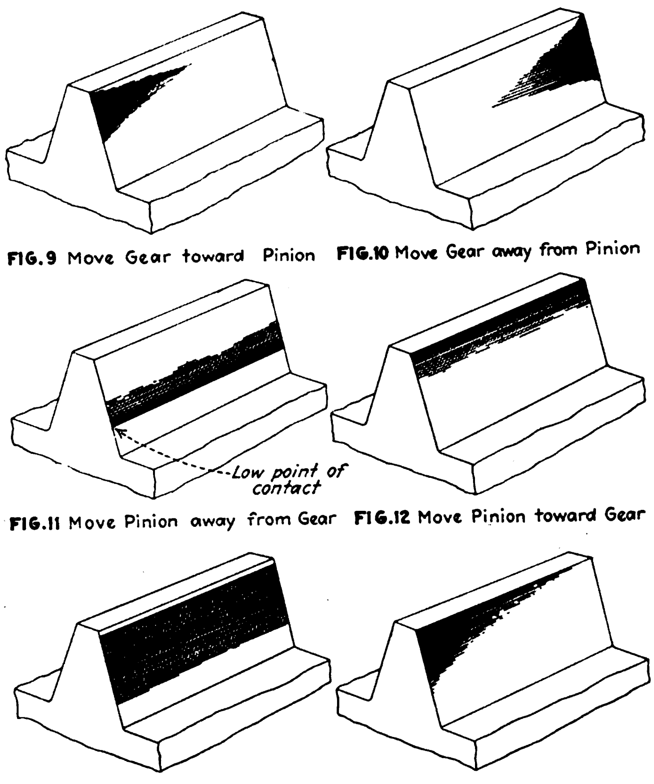


FIG.9 Move Gear toward Pinion FIG.10 Move Gear away from Pinion

FIG.11 Move Pinion away from Gear FIG.12 Move Pinion toward Gear

FIG.13 A Correct Bearing FIG.14 Move Pinion toward Gear, and move Gear toward Pinion

FIGS. 9 TO 14. BEARING ON GEAR TEETH

is made in the angle of shafts upon which they are mounted. Gears cut without backlash cannot be operated at 90 degrees.

A mean allowance of 0.008 in. has been adopted; gear and pinion each being cut 0.004 in. under the calculated tooth thickness. However, owing to necessary working limits, also to changes due to hardening, this allowance cannot be strictly maintained and will vary in the finished product from 0.005 in. to 0.020 inch.

General Procedure

Backlash cut in bevel gears cannot render them noisy if they are assembled to a proper *bearing*. Gears operating with too much backlash are usually noisy—not on account of their excessive backlash, but by reason of their being out of their proper position. Gears cut with 0.100 in. backlash and operating with 0.100 in. backlash will be satisfactory. The gear should be placed according to bearing—not to backlash. Under full load the ideal bearing is the full length of the tooth. On account of a slight distortion common to all automobile axles, gears should be set with this bearing somewhat toward the small end of tooth, the amount depending upon stiffness of axle construction. As previously explained, this condition is obtained mainly by the adjustment of the gear.

Note bearing along gear tooth. If the bearing is heavy on the large ends of teeth (Fig. 9), move gear toward the pinion. If the bearing is too heavy on the small ends of the teeth (Fig. 10), move gear away from pinion. Under the same load as will be applied to the axle in service, the bearing should be even the entire length of the teeth, and if this load is applied, gear should be so adjusted that this contact exists.

If a lighter load is applied in test, the bearing must be heaviest on the small ends of the teeth to allow for spring in the axle or for lift of pinion. This allowance depends upon the relation of the loads applied, and upon the construction of the axle. The position of the gear practically controls the bearing along the teeth. Moving the pinion to or from the gear has the same effect, but to a less extent.

After a proper bearing is secured along the tooth, the next problem is to bring the pinion into a position that will insure the engagement of equal pitches. After this again adjust the gear, if necessary, to restore the proper contact *along* the tooth if the pinion has been moved far enough to alter this. The proper position of the pinion is evidenced by the position of the contact on the profile of the gear tooth as follows: When the engaging pitch of the pinion is greater than the pitch of the gear, the bearing along the gear tooth runs toward the bottom of the gear tooth (Fig. 11). If the gears are operated for any length of time, extreme wear will take place at this point, due to the interference of the tops of the pinion teeth, which will show a heavy bearing (Fig. 5). This condition indicates that the pinion must be moved from the gear until the contact just begins to leave its lowest point. Contact should, under ideal conditions, just reach this low point on the gear tooth, *but should not be concentrated there.*

When the engaged pitch of the pinion is less than the pitch of the gear, the bearing along the tooth runs toward the top of the gear tooth as illustrated by Fig. 12, and is concentrated at the flank of the pinion teeth (Fig. 6), causing interference at this point. To correct this, move pinion toward gear until the contact just reaches the lowest point of contact on gear tooth.

If gears are cut theoretically correct, the contact will extend from near the top of gear tooth to the lowest point of contact (See Fig. 13); that is, to its effective bearing above pitch line. The location of the low points of contact on the gear teeth depends upon the diameter of the pinion, the proportion of the teeth and angle of obliquity, and must be found by experiment for each particular ratio. The contact on gear tooth should begin at this point and should be made to extend up to the tooth as far as possible without drawing it away from its lowest point.

With an undertsanding of the foregoing points, no special explanation is necessary regarding Figs. 2 and 3. For ratios such as shown, the position of the gear practically controls the bearing along the tooth, and the position of the pinion, the bearing on the profile of the tooth. A movement of the gear affects the profile bearing to a less extent, as does a movement of the pinion affect the bearing along the tooth. For miter gears (ratio 1 to 1) the effect of a movement of either is equal in each respect.

It is often possible to properly locate a pair of gears by one movement of either gear or pinion. Suppose, for example, that when the gear is first painted, the bearing shows slightly heavy on large ends of teeth, indicating too much backlash, and the bearing is out

toward the points of the teeth, indicating pinion too far away from gear. (See Fig. 14.) See also Fig. 7, in which case drawing the pinion away from the gear may drop bearing to its proper place and bring it across the full length of its tooth.

By simply moving the pinion toward the gear, the contact is brought farther down the profile of the gear tooth, and at the same time owing to the amount of backlash being reduced somewhat by this movement, the bearing will travel farther down toward the small end of the tooth. However, if this pinion movement has not changed the bearing *along* the tooth a sufficient amount, the gear must be moved toward the pinion.

The Block Test

The usual practice of mounting the axle on a block and adjusting the gears to their quietest position, under load, will not give the satisfactory results. Noise cannot be used as a basis for gear adjustment under these conditions. Aside from this, the operator is working entirely in the dark as regards the relative position of the gears and after testing a few axles, becomes tone deaf.

After assembling, the axle may be mounted on a block or if pressed steel construction is used, the best plan is to mount the carrier in a saddle or any convenient arrangement to run gears under load. The proper load to apply should be at least one-third the maximum power to be applied to the axle when under the car, at a speed corresponding to twenty miles per hour.

After attaining the desired bearing, the pinion may be readjusted to the quietest point at which it will operate *without disturbing the bearing attained.*

Exceptional care is ordinarily taken in the manufacture of the straight tooth gears to avoid cross bearing, so when cross bearing is found to any extent detrimental to their operation, it may be safely assumed that the trouble is due either to the machining or to the distortion of the axle or carrier.

It is difficult and generally impossible to quiet a pair of gears (straight tooth) if the axis of pinion is not on a plane with that of the gear. This is especially so when the bearing is heavy on the large end of the tooth on the drive and on the small end of the back-up or reverse drive. This bearing indicates that the axis of pinion is higher than the axis of the gear. A slight indication in the opposite direction is usually beneficial. For satisfactory results, the pinion axis should not be more than 0.001 in. above or 0.004 in. below the axis of the gear although 0.000 in. above and 0.005 in. below is better practice.

With spiral bevel gears it is impracticable, for the present at least, to furnish gears which will show a full length bearing on each side of the tooth. This is due to the nature of the spiral tooth which changes the position of its bearing, due to conditions of hardening. The nearest approach to a full bearing which can be maintained is a two-third length from opposite ends of the tooth. In this connection, care must be taken not to cramp the action of the gears in an attempt to secure a front end bearing in case this cross bearing is found heavy toward the large end of the tooth on the drive side. *At least 0.004 in. backlash should be obtained.*

On left-hand spiral gears the tendency is for the bearing to be found, when crossed, heavy on the large end of the drive and for right-hand gears heavy on the small end of the drive. The drive side of the tooth should always be favored in adjusting for bearing; the reverse side is usually of relatively small importance. When the gears show an acute cross bearing in either direction, there is little chance of getting them quiet, and continued re-adjustment under the car is usually a mere waste of time. This is one error that cannot be compensated for by any position of the gears.

When we have gears of an even ratio such as 48 to 12, 52 to 13, 56 to 14, 45 to 15, etc., the bearing along the gear teeth will be uneven if the pinion runs out the slightest amount. Under such conditions the bearing will begin, say at the large end of the tooth and track across the face until it is at the small end of the tooth, then back across the face until it is again heavy at the large end. This will occur three times around the gear for a ratio of exactly 3 to 1, four times for a ratio of 4 to 1, etc.

A full even bearing all around the gear cannot be produced commercially *for any even ratio.* Each tooth in the gear engages the same tooth in the pinion at each revoltuion, and any unevenness, particularly in the pinion, will show an uneven bearing. Therefore, when adjusting the gear for any even ratio, an average bearing must be taken for position. Uneven bearing should not be confused with cross bearing.

After hardening, it is not to be supposed that the ring gear can be made to run as true as when soft, therefore some allowance must be made. Provision has been made in cutting the teeth for a reasonable amount of out-of-round, and when making final inspection test of assembled differential and pinion, no particular attention is paid to the running of the gear unless an out-of-round is in evidence. In this event the ring gear should be removed and brought within 0.008 in. on face and diameter. It is evident that gears may be found which run out in excess of these limits without being detrimental to their quiet operation; the arc through which any such runout occurs must be considered.

Bottoming of Teeth

The fact of the teeth bottoming when set together by hand or when gears are operated without backlash is no indication of incorrect cutting. All six-pitch, many five-pitch, and in some cases even four-pitch will show this apparent defect. There is no danger of this bottoming action when gears are properly assembled, that is, with a proper amount of backlash, or more properly expressed—with a full face bearing.

Reducing the thickness of the teeth for backlash allows the pinion to drop deeper into mesh with the gear, which drop in many cases amounts to the total bottom clearance of tooth. In operation, however, the pinion should be held out of this engagement. A properly assembled pair of gears cannot bottom, no matter how thin the teeth may have been cut.

Bevel gears are cut to operate at a shaft angle of 90 deg. The axle should be machined in accordance with this. If the axle is less than 90 deg. the amount of backlash in the gears is necessarily reduced; if greater than 90 deg. the backlash is increased, that is, when maintaining an even bearing along the teeth.

For 14½ deg. teeth, 3.8 min. change in shaft angle affects the backlash 0.001 in. For 20 deg. teeth, 2.7 min. makes the same change. For satisfactory results the proper shaft angle should be maintained within 5 min. plus or minus for the 14½ deg. teeth and within 3 min. for the 20 degrees.

Although the foregoing plan of gear adjustment may

appear extremely simple, it requires a little practice before an operator becomes proficient in its use. For this reason a record of setting made should be kept until operator can definitely foretell the result of a given position for the gear. As each axle is adjusted, make a record of axle number, position of bearing along the teeth on both drive and reverse, profile bearing on each side of teeth and amount of backlash. Opposite these data should be noted the performance of the axle under the car.

In a short time the operator will begin to see what is required to produce quiet axles, and will detect axle distortion if it exists and know how to counteract or to allow for it. The desired bearing for each particular type of axle must be found in this manner.

The Road Test

It is quite possible that the position of pinion will sometimes require a slight adjustment after the axle is under the car, as it is not always possible to locate it with sufficient accuracy according to the bearing. This is generally due to spring in the axle or to looseness in construction, or both. Also, it should be understood that a pinion movement of 0.005 in. in either direction often secures results. This adjustment is usually readily made and should be considered a part of the regular road test. If the axle is noisy after the best position of pinion has been secured, it should never be necessary to move the gear. However, if the gears have been set as directed, and the drive is noisy under car, the best general rule for this is as follows:

If the axle construction is such that the differential bearing supports are weak and have a tendency to spread, move the gear up towards the pinion, reducing the amount of backlash. If the principal weakness is in the third member, or in the pinion sleeve, or is in fact anything which will allow the pinion to lift, change its axial position or whip, move the gear away from the pinion, increasing the amount of backlash, or have the gear cut specially to meet this condition. Adjusting the *gear* under car is poor practice.

To adjust gears under the car, remove oil and clean gears with gasoline. Paint the gear all around with a mixture of red lead and oil and leave off rear cover so that gears are exposed. A short run, say five or six miles without lubricant, will not injure the gears, although bearings should be lubricated. As a preliminary test, the rear end of the car may be jacked up in the garage and show bearing on teeth by applying brakes.

Adjusting gears at random in an endeavor to locate their quiet operating position is poor practice, particularly with spiral gears, as rapid wear in both gears and bearings is very liable to result. *Get the bearings.*

In gears operating with 0.008 in. backlash, a pinion lift of 0.005 in. should not be exceeded, as this barely leaves operating clearance. If the lift of pinion exceeds this amount, the error may be taken care of to a certain extent in the cutting of the gear up to about 0.015 in. If beyond this point, there is little hope of securing quiet gears. For spiral bevel gears it is especially necessary to check for changes in the axial position of pinion, particularly between the drive and the reverse.

Before a new design of axle or carrier is manufactured in quantities, a sample should be assembled and subjected to a static test, in order to locate any weakness which may exist in its construction. The principal parts to be checked are the end movement of differential and of pinion, the lift of pinion and the spread of differential bearings. The latter is of special importance if cup and cone or taper roller bearings are used.

In long third member construction the distortion of drive shaft and torque tube is of importance. The load applied to the pinion shaft should represent the maximum power of motor at 1,000 r.p.m., carrying this power through the lowest transmission gear, usually 3⅓ to 1. This means calculating the torque load from the full power of motor at 300 r.p.m. of the pinion.

Using 36-in. lever on pinion shaft the proper load may be found as follows:

Weight equals 5.833 × horsepower.

In any other length of lever we have—

$$\text{Weight} = \frac{210}{\text{Length of lever in inches}} \times \text{horsepower}$$

From this may be deducted one-half the weight of lever.

The possible effect of a change in the gear ratio must not be ignored when conducting a static test or in the event of any trouble being experienced with the axle. An axle perfectly satisfactory with a ratio of 3 to 1 will possibly give an enormous amount of trouble if a 4 to 1 gear is applied. The difference between a 3 to 1 and a 3½ to 1 reduction is very noticeable from a noise standpoint. Axles should be designed to meet the requirements of the lowest reduction to be employed, and upon general principles have the least reduction possible.

General Precautions

Never allow gears to be assembled in a cramped position. The gear should revolve freely after all bolts and adjustments are set. Be sure that the thrust end of the differential is seated against the thrust bearings, otherwise the gear may change its position in service. A partial turn of the adjusting nut opposite the thrust bearing is generally advisable, so as to avoid any possibility of cramping the bearing. This, of course, does not apply to cases when conical or radial bearings are employed.

Profile bearing should, if anything, be placed a little high, rather than low, especially for left-hand spiral gears and right-hand pinions, owing to the tendency of the pinion to crowd a little forward on service. When replacing gears for service, examine bearings carefully; worn, chipped or pitted bearings should be replaced. Outer ball races must be a snug fit in the bearing holes, and inner races must be a snug fit on shafts or differential hubs.

Make sure that all parts which go on the inside of housing are thoroughly clean. Any chips, grit or other hard substances grind out the bearings and gears very quickly. A lost nut or lockwasher may necessitate a new set of gears. All studs and nuts to be a good fit in threads so as to hold gears and bearings in place. If these are loose the gears will vibrate.

The plan of adjusting bevel gears herein outlined is not an experiment. It is a proper method, based upon the true nature of tooth contact. Some trouble in its application is to be expected. The operator must become familiar with the causes underlying changes in tooth contact and apply this knowledge to the particular axle under consideration. When mastered, uniform satisfactory results can be guaranteed.

A complete understanding of the principles given in this article will enable the operator to either locate the gears in a satisfactory position or to determine why they cannot be so located.

Machining a Case Hardened Mack Crankshaft

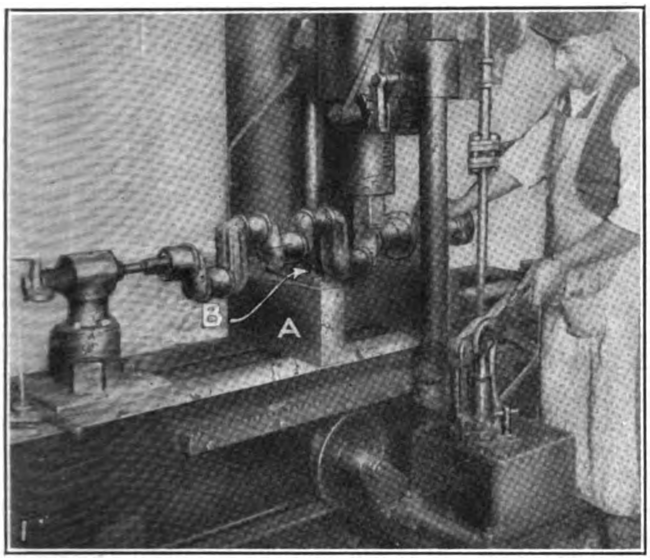
Hard and Long-Wearing Surfaces Secured by Case Hardening—Straightening, Turning and Grinding Operations—Balancing, Final Straightening and Inspection

BY FRED H. COLVIN
Editor, AMERICAN MACHINIST

THE engineers of the Mack motor found it advisable to use case hardened carbon steel crankshafts in place of special alloys, on account of the extremely hard surface produced on the pins and bearings. These shafts have given excellent results as the case-hardened surfaces seem to resist wear remarkably well and there has been no trouble from breakage, owing to the size of shaft used. It is interesting to note that at least one of the builders of high-grade passenger cars is adopting this same method with extremely satisfactory results.

The forgings are very carefully inspected, after which both ends are centered and the crankshaft straightened. Ample provisions are made for straightening, as can be seen in Figs. 1 and 2. The crankshaft is revolved on the centers shown but the centers do not, of course, bear the brunt of the straightening pressures. Blocks are provided as at *A*, Fig. 1, and wedges such as *B* are slipped in place between the blocks and the crankshaft, so as to take the stresses due to the application of hydraulic pressure by the pump shown. Fig. 2 shows the shaft being sprung in the center while in Fig. 1 the end web is under pressure.

Then comes the turning of the main bearings and the crankpins, as can be seen in Figs. 3 and 4, both American and LeBlond lathes being used for this purpose. After the bearings have been turned, the crankshaft is carburized and straightened again, should the latter be



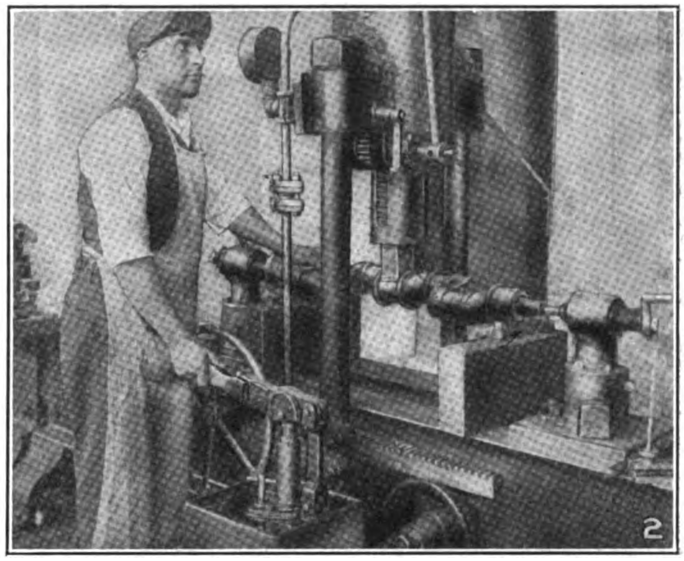
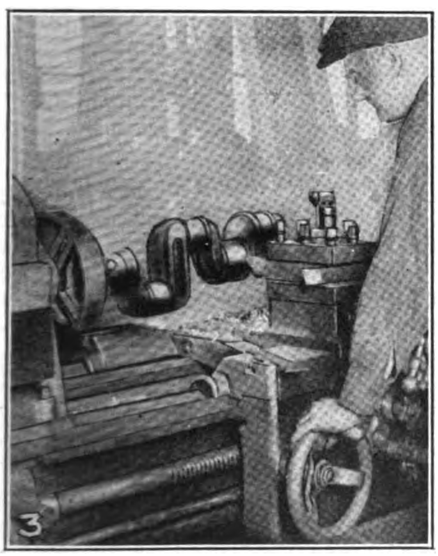


FIG. 1. STRAIGHTENING A CRANKSHAFT FORGING. FIG. 2. SPRINGING IT SIDEWAYS



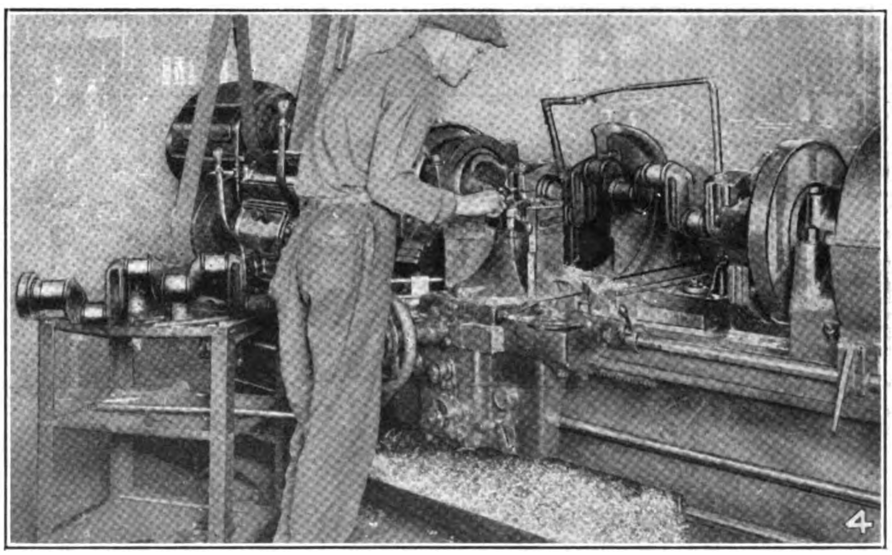
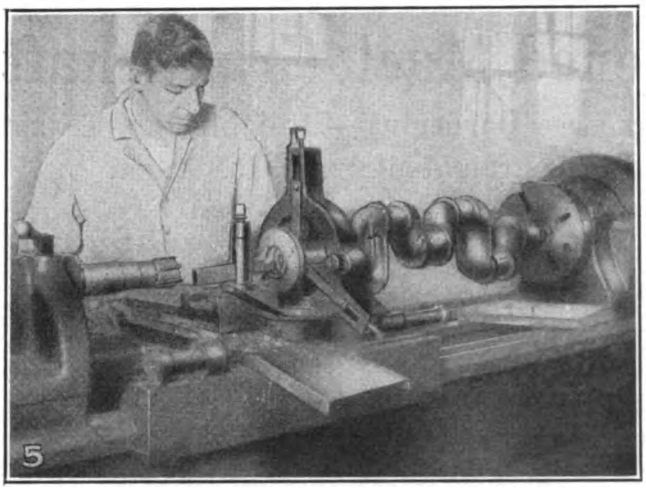


FIG. 3. ROUGH-TURNING THE BEARINGS. FIG. 4. ROUGH-TURNING THE CRANKPIN



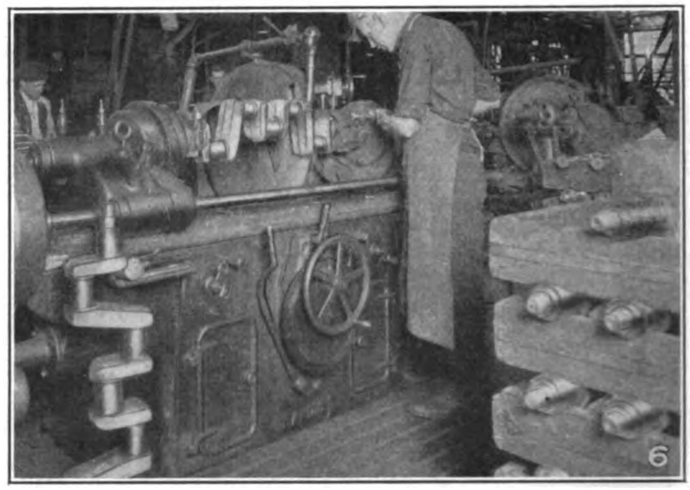


FIG. 5. TURNING AND FACING FLANGE. FIG. 6. ROUGH GRINDING THE PINS

found necessary when it comes from the carburizing furnaces. Then the flanges are rough-turned and faced as shown in Fig. 5 and the thread end and gear seat are roughed out as is the ball race. The thread end is then cut off and recentered and the shaft is ready for hardening.

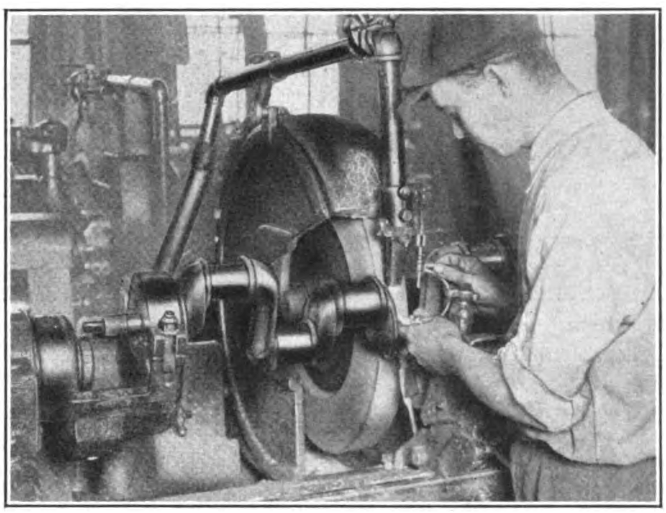


FIG. 7. MEASURING THE PIN DIAMETER

This means heating to 1,600 deg. F. and quenching. Then comes the inspection for hardness and the annealing of the flange of the thread end. Sand blasting is now in order to remove the scale and the shaft is then straightened very carefully, the tolerance being 0.007 inch.

The flange end which has been previously annealed is now finish-turned as is the gear seat and the end to be threaded, after which the threads are cut. The shaft is then recentered for grinding and the rough-grinding of the main and crankpin bearings now takes place.

In Figs. 6 and 7 are shown two of the grinding operations on different shafts. Different types of grinders are employed, as can be seen. The rack at the right in Fig. 6 shows a convenient way of stacking crankshafts in a compact manner and at the same time, in such a way that they will be perfectly safe against damage to the round surfaces. Stacking is accomplished by the use of wooden frames with notches cut in the proper positions so as to keep the crankshafts from rolling in either direction. As can be seen in Fig. 7, the micrometer is used for measuring the crankshaft diameters.

The crankshafts are then balanced and straightened as shown in Fig. 8, substantial balancing ways and a convenient screw press being used for this purpose. The large grinding stand at the rear enables sufficient metal to be ground off the heavy portion of the shaft to secure the desired balance.

All the finish-grinding of pins and bearings now takes

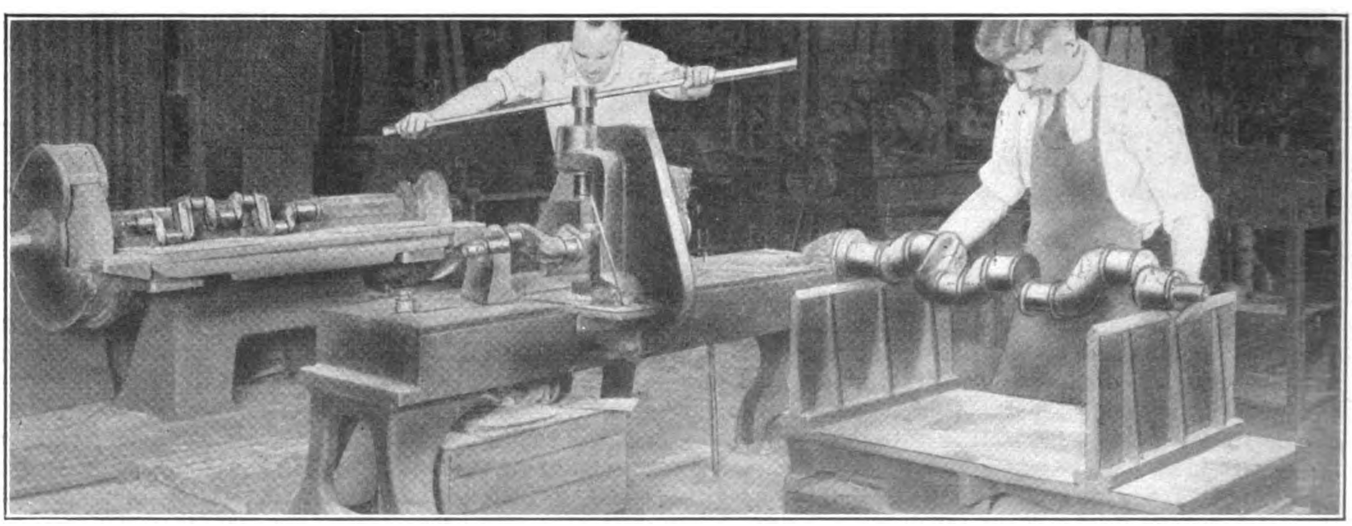


FIG. 8. BALANCING AND STRAIGHTENING THE SHAFT

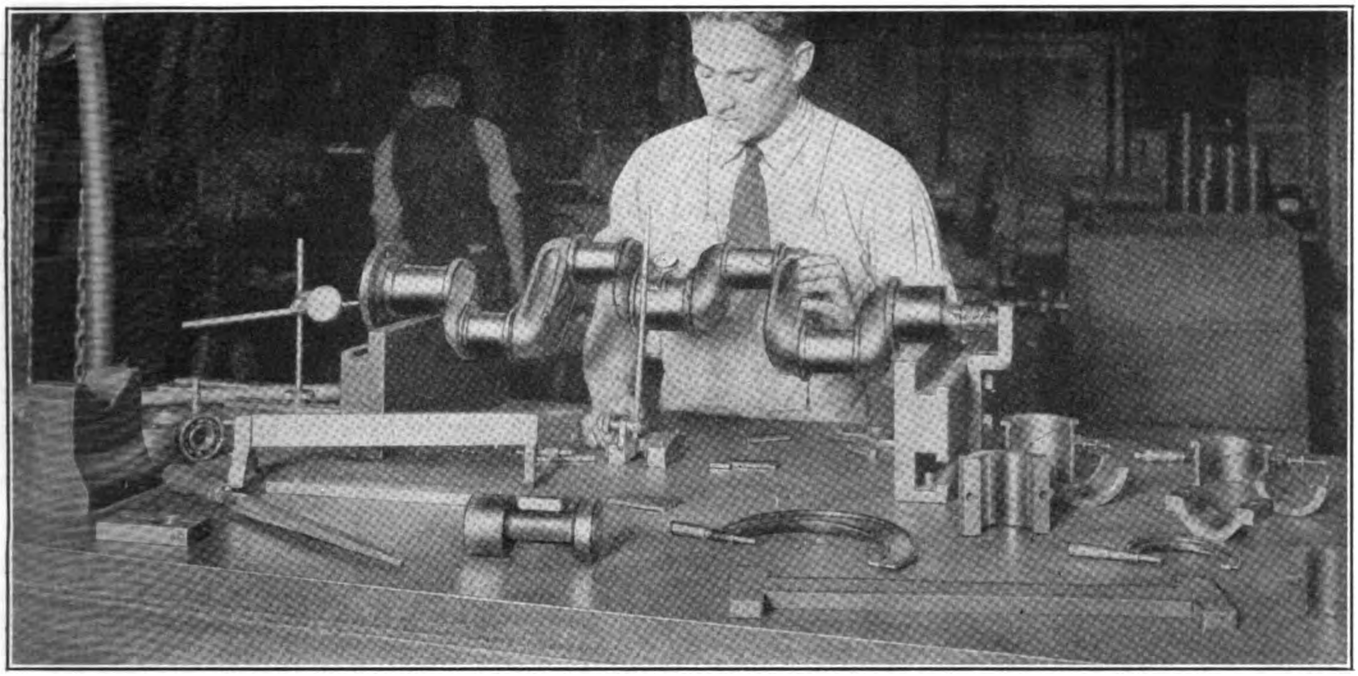


FIG. 9. THE INSPECTION BENCH

place together with the drilling and reaming of the flange holes and the milling of the keyway. The ball race is finish-bored and the sides of the flange are then faced so as to insure a true-running flywheel.

Then comes the final inspection of all machining operations, as shown on the bench in Fig. 9. The inspector is provided with suitable supporting stands and all kinds of testing instruments for inspecting not only diameters, but alignment of the shaft, shoulder distances, length of bearings, and the truth of the flange at the end. Care in crankshaft work has much to do with the successful operation of a motor and every precaution is taken to insure satisfaction at this point.

Selling the Salesman

BY DWIGHT DONALD

An editorial on page 228 of AMERICAN MACHINIST, entitled "For Your Own Good, Listen to the Salesman," demanded a second reading. I agreed with it on the first reading and I was still in accord with it after the re-reading—for it held arguments based on conditions that cannot be denied by any broad-minded business man.

Withal it was a strong plea in the interest of "selling the salesman," who today, during this time of extreme business depression, is needed more than ever by the producer of goods. The manufacturer does need the visiting salesman as a source of information as to where he can purchase equipment capable of turning out a product of high quality at the lowest possible cost. On the other hand, the salesmen in his own organization are indispensable in disposing of the material which he produces.

Nevertheless, the editorial title persists in coming before me in the form, "Salesman, for Your Own Good, Listen." By this transposition I would not seem to recommend that the salesman listen interminably to the general gossip of some purchasing agent or particularly sociable clerk whose time is hanging heavily on his hands. Admitting that sociability necessarily enters in the selling game, the interviewer has an hourly value to his employer and an hour spent in idle gossip is sixty minutes added to the cost of buying and selling.

Of course, the salesman must listen to sideplays and endeavor to learn and remember the hobbies of his prospect, so that he may cultivate as close a friendship as possible, for acquaintance is rated as a high percentage in successful dealing with the buyer. However, as the salesman listens let him decide whether he is talking with one who is in a position to make or recommend purchases, and in any instance to judge when he has reached the peak in his effort to sell. Don't let the interview reach an anticlimax each time, so that the prospect comes to regard the salesman as an unprofitable pest. If the buyer is affected with an unusual degree of sociability (some salesmen will be dubious about the existence of such a species), he invariably enjoys a relation of his own experiences, rather than having to listen to the life history of the salesman or a discourse on how he put over the last big sale.

Today there are many salesmen, be they on straight commission or salary, who appear to have the spirit, "The world is not buying, anyway"—and therefore consider each stop as a place to rest and spin a few yarns, with the excuse that they are doing missionary work.

Oh, by the way, I too have been of that honorable profession of those who travel from town to town and from desk to desk. Now that I am stationed back at the plant, and have occasion to meet many of the boys at my own desk, I am decidedly not the type of "gentleman" (by courtesy only) who tries to get back at the world for some unpleasant experience he may have suffered at the hands of some sixth assistant purchasing agent, recently promoted from office boy.

With this explanation I am sure my remarks will be accepted by our salesmen friends as suggestions rather than harsh criticism.

But, salesmen, keep on dispensing your optimism which we all admire and need; continue to spread the telling story of your product; know when you are through, and don't outwear your welcome—and come again! We need such "ambassadors of commerce."

Selling on Quality

Price Concessions Easier for the Salesman but Dangerous to the Builder—Foreign Competition Stronger Since War—Early Action on Standards Essential

BY J. B. DOAN
President, American Tool Works Co.

SELLING on a declining market is a hard job no matter what policy is adopted by the seller. Most buyers of machine tools are just as familiar with the business situation as are the sellers, and they are not slow to press their advantage. As a result the seller may be led or forced to price concessions, particularly if his financial condition is weak. Such a course is too often the first step to practical business suicide.

When a purchaser discovers that he can beat down a salesman's price, the salesman's position becomes an unenviable one. A shrewd buyer will go at him with statements or hints of a more or less veiled character, to the effect that his competitor has shaded his price or offered certain extra equipment. The final price in such a situation is largely dependent on the ability of the buyer to play on the credulity of the salesman and his anxiety to make the sale no matter what the cost.

> A SALE MADE on a quality basis at list price is well worth many times the effort expended in making one on a cut-price basis.
> The customer is satisfied and will be easier to sell the next time, instead of harder. The salesman has gained confidence from his success in selling on a straightforward business basis and will tackle his next prospect with added vigor. The manufacturer has made a fair profit on the sale and can afford to maintain and improve the high quality expected of his product.

Aside from any consideration of the ethics of price cutting, the salesman's knowledge that his house will permit him to make concessions never fails to extract some of the drive from his efforts to land orders at list price. Under fire both from his competitors and from his customer, it takes a man with considerable backbone to resist the combined pressure and sell his product solely on its merits.

BUYING PRODUCTIVE CAPACITY

On the other hand, if he has no discretion in the matter of price, but must sell at list or lose the sale, the salesman can concentrate on impressing his customer with the fact that he is buying productive capacity which will make profits, rather than so many pounds of manufactured iron and steel. In these times even the best salesman needs every bit of concentration he can muster to convince a prospect on this basis. His chances of success are much reduced if the distracting thought is present in the back of his mind that if he fails to sell on quality and service ability he can fall back on price concessions.

A good many years ago we had a convincing demonstration of the truth of the assertions just made. One of our best salesmen was working the southern territory during a period not unlike the present, and price-cutting was going on everywhere. Our man, whom we may call Williams because that wasn't his name, was not getting results. We knew he was up against a tough proposition but he had been in the same fix before and had made good. His reports were pessimistic, business was rotten and nobody would even listen to sales talk at list prices.

Finally an order came in from a customer to whom Williams had quoted our dealer's price. This was contrary to custom, but not to orders, as Williams was a big enough man to have the privilege of using his own judgment about prices in emergency cases. But this was not an emergency case. His action was decidedly unjustified by conditions, and so fifteen minutes after the order came in this telegram was on its way to Mr. Williams. "Absolutely maintain prices. Judgment removed from you."

The telegram had the desired effect. Without the price concession crutch to lean on Williams pulled himself together, put his old enthusiasm into his work and commenced sending in list price orders again. That one incident was enough for us. It established a sound principle which has been maintained ever since.

While we are talking about maintaining prices I want to bring out one more point—the customer's attitude after he has succeeded in beating down a salesman or a manufacturer. At first he is very well pleased with his own sagacity and business acumen, but before long he can't help wondering whether he really beat the other fellow down as far as he might have. He begins to have doubts as to whether he was actually so very smart after all, and he usually winds up by coming to a hard and fast decision to be sure to reach the bottom the next time he has to buy anything from that company. He knows their weakness and he can be trusted to make the most of it. Having once forced a price concession his confidence is shaken and he will never be quite satisfied in a future deal no matter how favorable the terms he gets.

But there is another side to the picture. Everyone knows that comfortable, soul-satisfying feeling which comes with the possession of anything of first quality. It makes no difference what it is, an automobile, a fine house, a good coat, a high-grade machine tool, the feeling is there just the same. Even though part of the feeling may be due to the complacency of owning a better article than the other fellow, there is at the same time the solid conviction that quality goods are cheapest in the long run and produce the best results.

Another phase of the same psychological phenomenon is the almost universal desire to improve one's condition of living, keenest perhaps in Americans. Take your own experience with motor cars or perhaps your neighbor's. The chances are that you begin with

a second-hand car or the cheapest one now available. It is ten to one that when you reached the point of getting another one you selected as much more expensive and inferentially better a make as your pocketbook would stand. If you stuck to the same make the odds are just as good that the manufacturer had improved his product sufficiently in the time between your two purchases so that the same effect was attained.

The desire for something better is a moving factor in American ambition and success and can well be played upon by the wise salesman. If he has the right stuff in him he can hammer away at this side of the customer's stronghold and while it may not be so vulnerable as the price side it can be scaled.

A sale made on a quality basis at list price is well worth many times the effort expended in making one on a cut-price basis.

The customer is satisfied and will be easier to sell the next time, instead of harder. The salesman has gained confidence from his success in selling on a straightforward business basis and will tackle his next prospect with added vigor. The manufacturer has made a fair profit on the sale and can afford to maintain and improve the high quality expected of his product.

It should be obvious that selling on quality is utterly impossible unless the quality actually exists. The builder must make certain that his machine is at least as good as any other of the same type on the market, and better than the great majority of others. He must keep constantly at work to improve the quality and it is well to keep the field informed of improvements as they are made. His salesmen must know that the quality is there, and where and why and how, and must be so proud of it that their enthusiasm is contagious.

As I stated above, quality can only be maintained if a fair price is secured for the product. The two are mutually dependent and it is a hopeless job to try to build quality tools if they are to be sold at a loss. It simply can't be done very long. Either the quality suffers or the builder goes broke.

We feel that not only must the shop be manned by the very best machinists but the equipment must be thoroughly up-to-date. In our own plant we have taken advantage of dull times to go over every machine and either repair or replace it. In our radial drilling department, for instance, we sold the twenty-four machines of different sizes that had been there for several years and replaced them with seventeen new ones from stock. The new machines take up much less room and consequently cut down the departmental overhead, but in addition they are so much more efficient that the seventeen will turn out more work than twenty-four did before.

While we are talking about shops and equipment it might be well to say that this country no longer has the monopoly of methods and tools that it had before the war. Then we could build a quality tool here as cheaply as an ordinary one could be built in Europe. We understood production methods and interchangeable manufacture; they did not. But the war has changed all that. The British and French inspectors learned a lot in our munition plants and they are turning their knowledge to account. Then, too, there are many plants, both in England and on the continent, which are thoroughly equipped with the most modern machinery. We certainly sold a lot of it abroad during the war and our Army left a whole lot more behind them. It will take all of our famous ingenuity to keep ahead and even then we will be hard pressed if we don't get started on standardization of minor parts.

There is no reason on earth why every manufacturer of machine tools should insist on having his own pet systems of standards for such things as T-slots, spindle noses, handwheels, ball cranks, etc. The differences are so small as to be insignificant, but they add tremendously to production costs.

There is keen interest in these matters abroad. England, France, Germany, Holland, Belgium and others are studying standardization, and Germany and Holland have already issued accepted standards for certain parts. We can't afford to let them beat us at this game. If they do we shall soon have to face cheaper imported tools in our own markets than are coming in now.

Suggestion for Herringbone Gear Standards

By N. Leerberg

The action of the American Gear Manufacturers' Association in standardizing herringbone gears is a very commendable move. But standardization should in all cases take simplicity into consideration, especially when such standardization is based on arbitrary or empirical data. The table of "Enlargements for Pinions with 17 Teeth or Less," published on page 330 of American Machinist, is such a case. This table is calculated from the well known interference formula for 20 deg. standard addendum teeth:

ENLARGEMENTS FOR PINIONS WITH 17 TEETH AND LESS

No. of Teeth	Diametral Pitch 10	8	6	5	4	3.5	3	2.5	2	1.75	1.5	1.25	1
7	0.120	0.150	0.200	0.240	0.300	0.340	0.400	0.480	0.600	0.680	0.800	0.960	1.200
8	0.108	0.136	0.180	0.216	0.270	0.306	0.360	0.432	0.540	0.612	0.720	0.864	1.080
9	0.096	0.120	0.160	0.192	0.240	0.272	0.320	0.384	0.480	0.544	0.640	0.768	0.960
10	0.084	0.104	0.140	0.168	0.210	0.238	0.280	0.336	0.420	0.476	0.560	0.672	0.840
11	0.072	0.090	0.120	0.144	0.180	0.204	0.240	0.288	0.360	0.408	0.480	0.576	0.720
12	0.060	0.076	0.100	0.120	0.150	0.170	0.200	0.240	0.300	0.340	0.400	0.480	0.600
13	0.048	0.060	0.080	0.096	0.120	0.136	0.160	0.192	0.240	0.272	0.320	0.384	0.480
14	0.036	0.046	0.060	0.072	0.090	0.102	0.120	0.144	0.180	0.204	0.240	0.288	0.360
15	0.024	0.030	0.040	0.048	0.060	0.070	0.080	0.096	0.120	0.136	0.160	0.192	0.240
16	0.012	0.016	0.020	0.024	0.030	0.034	0.040	0.048	0.060	0.068	0.080	0.096	0.120
17	0.002	0.002	0.002	0.002	0.002	0.004	0.004	0.004	0.006	0.006	0.008	0.010	0.012

$$x = \frac{1 - 0.05849\,N}{P}, \text{ or}$$

$$\text{Enlargement} = \frac{2(1 - 0.05849\,N)}{P}.$$

The herringbone gear has a stub tooth, however, and does not need this amount of enlargement to avoid interference. The object of the enlargement is mainly to give a free cutting action to the hob. There is, therefore, no need of the rather complex dimensions given in the table. The writer has, consequently, rearranged the table as given above, and strongly recommends its consideration.

In this table the last column is changed to multiples of 0.120. The dimensions in the remaining columns are in inverse ratio to the diametral pitch. It will be noticed that the values in each vertical column are multiples of 0.012, 0.015, 0.020, 0.024, 0.030, 0.034, 0.040, 0.048, 0.060, 0.068, 0.080, 0.096 and 0.120 respectively. All dimensions are even so that the addendum may be dimensioned without running into four decimal places. The table agrees closely with the original table and is more commendable for practical use.

Calite—A New Heat-Resisting Alloy

By G. R. Brophy

Metallurgical Engineer, Industrial Furnace Department, General Electric Company

A freshly cut surface of aluminum, like all metals, will show a bright lustrous surface, but after a very short time in the atmosphere becomes dull. On longer exposure little change takes place in this strongly adherent coating. This is recognized as a protective coating of oxide. Aluminum when alloyed in solid solution with other metals, still retains this property of oxidizing readily and lends it to the alloy.

Advantage was taken of this property a few years ago when calorizing was developed. This process consists of coating metals with aluminum at high temperature, actually forming a surface alloy which is highly resistant to oxidation at high temperature, and to many forms of corrosion. Calorizing is not suited for work above 1,832 deg. F., due to the rapid diffusion of aluminum and the consequent lowering of the surface aluminum content to the point where breakdown under oxidation occurs.

Properties of Iron and Aluminum Alloy

A homogeneous alloy made by melting aluminum with iron naturally will show no such diffusion on subsequent heating, and provided the aluminum content is sufficiently high, the alloy will resist oxidation at temperatures nearly up to its melting point. Unfortunately, on repeated heating and rapid cooling, or uneven heating, these alloys crack badly and no homeopathic doses of any third metal tried—and nearly all were tried—helped this condition. The hot metal when the least moisture touched it acted like hot glass, flying to pieces.

The low expansion of high nickel steels, together with the fact that aluminum and nickel form a high melting compound, led to investigating the promising ternary alloys of aluminum, nickel and iron. Therefore, keeping aluminum at a minimum and substituting nickel for iron in various percentages, a series of alloys was obtained which showed increasingly good properties. However, when nickel reached 15 per cent the alloy was soft and lost nearly all its resistance to oxidation. This was probably due to the formation of the high melting compound corresponding to the formula NiAl, which, while highly resistant to oxidation itself, robbed the iron of its protection and allowed the iron to scale badly. Further additions of aluminum and nickel in proportions other than that of the above compound, finally gave an alloy which was strong, would stand shock, hot or cold; could be quenched repeatedly; and was highly resistant to oxidation. A few further refinements gave the alloy which was finally adapted and which we call calite.

Manganese and silicon above 0.75 per cent both tend to decrease resistance to oxidation, but with care in melting no trouble is experienced. Carbon increases brittleness and should be kept as low as possible and easily runs under 0.05 per cent. On account of the ease with which SiO_2 slags with aluminum, the melting must be done in a basic furnace. Also the ladle must have a basic lining.

Basic Heroult-type furnaces are used with good success. Steel scrap is first melted down and decarburized; slag is removed and nickel is added and new slag made. When all is thoroughly deoxidized, the final slag is removed and scrap calite added to the extent of 25 per cent of the melt and dissolved. The melt is then poured into a preheated ladle containing the required amount of molten aluminum. As this alloying takes place, an exothermic reaction occurs of sufficient intensity to dissolve additional scrap, and up to the present scrap amounting to 15 per cent of the melt has been dissolved with sufficient residual heat to necessitate holding in the ladle several minutes. The ladle is bottom poured so that the time of holding allows all oxide to float and nothing but clean metal to be poured.

Calite resists oxidation up to 1,300 deg. C. (2,372 deg. F.), but 1,200 deg. C. (2,200 deg. F.) is recommended for indefinite service. The protective oxide formed is tight and does not snap off even on quenching from high temperatures. Quenching after 100 hr. at 1,200 deg. C., calite lost but 0.03 g. per square centimeter exposed, while the best heat-resisting base metal alloy other than calite lost 0.56 g. under the same conditions. The same samples were run at 1,300 deg. C. for an additional 25 hr. Calite lost 0.003 g., the other 0.09 g. per square centimeter exposed. From these figures it appears that calite is twenty times as resistant at 1,200 deg. C. and the only base metal alloy to stand at temperatures higher. At 900 deg. C., or ordinary operating temperatures, the loss per square centimeter was measured in $\frac{1}{10}$ mg., or for all practical purposes, no loss.

Calite is practically noncorrosive. Samples have been polished and run in a spray of saturated sea salt solution at 100 deg. F. for 200 hr., and at the end of this time still retained the perfect polish.

Twenty-five per cent sulphuric acid dissolves calite rapidly; hydrochloric acid slowly and nitric hardly at all. Forty-eight hours in 25 per cent nitric acid, the metal lost 0.0004 g. per square centimeter exposed. Acetic acid has no effect. Molten carbonates, chlorides, nitrates, cyanides, Pb, Zn, Sn, type metal, sulphur and sulphur vapor do not attack calite. SO_2 gas at 900 deg. C. has no attack. Fluxes such as cryolite, borates and silicates attack calite rapidly.

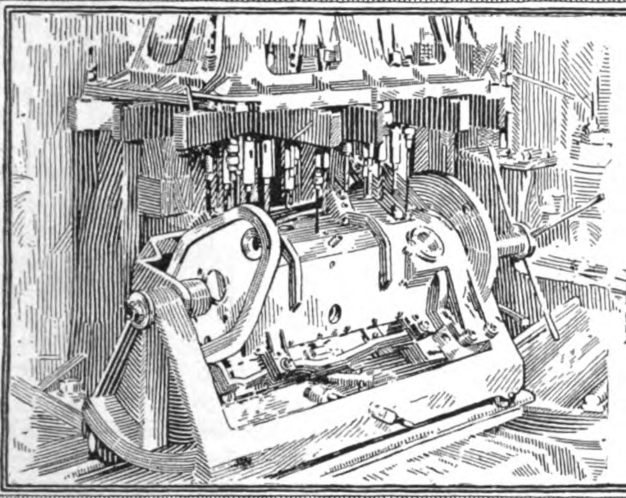
Physical Properties of Calite

In general, the physical properties are as follows:

Melting point, deg. F.	2,777
Softening temperature, deg. F.	2,500
Working temperature, deg. F.	2,200 to 2,370
Specific gravity	7.03
Weight per cubic inch, pounds	0.25
Brinell hardness, annealed	286
Scleroscope hardness, annealed.	40
Thermal conductivity, per cent of iron	25
Transverse stress, 1-in. square bar, pounds per square inch	4,250
Tensile stress, pounds per square inch	36,800

Calite cannot be machined in the cast condition, nor cut with oxyacetylene. Any change of dimension or finish must be done by grinding. It is more resistant to oxidation at high temperatures and will stand higher temperatures than any base-metal alloy tested. Its first cost is low and its operating cost lower than other non-oxidizing alloys. Boxes have been run for 1,500 heat-hours and remained in the best condition and measurements showed no warpage or growth. The oxide coating was no heavier than after the first heat.

Abstract of paper read before American Society for Steel Treating.



Tool Engineering

By

Albert A. Dowd and Frank W. Curtis

President and Chief Engineer

Dowd Engineering Company, New York City

Taper Turning Tools Continued — Engine Lathe and Turret Lathe Tooling—Cross-Slide and Turret Taper Tools—Plain and Adjustable Attachments

A SPECIAL taper attachment, useful when a number of different tapers are to be turned, is shown in Fig. 361. This tool is not of the adjustable type, but the taper bar is readily removable so that it can be replaced by another of a different taper. The body of the tool *A* is in the form of a bracket which is attached to the face of the turret. On this bracket a dove-tailed slide *B* provided with a taper gib is mounted. The upper part of the bracket is also dove-tailed and a taper bar *C* is fitted to it. An adjustable gib *D* is provided for this dove-tailed member also.

The angle of the taper is determined by the angularity of the slot *E* which is cut in the taper bar. The back of the slide *B* has a roller in it at *F*, traveling in the slot *E* and thus controlling the angle of the taper. In some convenient place on the headstock of the machine a bracket *G* is fastened, with an adjustable stop *H* projecting from it a distance sufficient to strike the end of the taper bar as shown. The tool *K* is carried in the block *L* mounted on the vertical sliding member *B*. In operation, the turret is brought forward until the bar *C* strikes the end of the stop *H*, at which time the feed is engaged and the tool moves ahead controlled as to its angle by the position of the roller in the slot *E*.

There are some points in this design which can doubtless be improved; for example, the projection of the tool *K* is excessive and the cutting action would be likely to cause it to dig in and chatter. It would be possible to build the entire mechanism in such a way that the tool would not overhang so much, so that there would be less danger of vibration. For light cutting, however, when a number of different angles are to be machined, a tool of this kind would produce good work.

The principle here shown can be applied to other varieties of taper turning tools. It would be possible, also, to make a similar arrangement for boring, although the toolholder and slide might be somewhat changed from the form shown. Another improvement on the same tool would be fitting the toolblock *L* in such a way that it could be adjusted up and down to take different positions on the slide, thus increasing the capacity of the attachment.

When work is long and slender it is difficult to turn it without support; hence a taper turning tool designed for a purpose of this sort should provide the necessary rest for the work. In the work shown at *A* in Fig. 362 a taper is to be cut on the end *B*, as shown by the dotted lines. On account of the length of the bar and the lack of center support, the tool itself must be so arranged that the work cannot vibrate during the cutting action. The body of the tool *C* consists of a bracket fastened to the turret face as shown. At the forward end of this bracket an angular block *D* is located, in order to carry the supporting bushing *E* in which the work is piloted.

The tool *F* is mounted in a block *G* which is fastened to a dove-tailed slide *H*. On the under side of this slide the stud *L* is fixed; and the spring *K* thrusts against this stud and causes the roller *M* to remain in contact with the taper blade *N* along which it travels. The roller is supported in a holder *O* fastened to the top of the slide. The illustration at *P* shows this construction clearly. The taper blade *N* is fastened to a substantial bracket *Q* at the rear of the cross-slide. The latter is firmly clamped in position longitudinally while the work is being done. It would be possible to attach one or more tools to the front of the cross-slide and use them for other operations on the work if necessary. In the present case, however, these tools are not needed as the cross-slide is not in use.

An additional refinement which would probably improve this design somewhat would be to make the bracket *Q* shorter, and provide the cross-slide with a hardened block over which the bracket *C* can slide, thus giving additional support. Changes would need to be made in the design of the bracket in order to provide for a condition such as this. Vibration is eliminated by the support which the work receives in the bushing. For shallow taper work an attachment of this sort is very useful, and if provided with suitable adjustments a number of tapers could be easily turned, and different diameters of work could be supported

by using different sizes of bushings. An oil cup *R* is used to lubricate the bushings.

Many engine lathes are provided with a taper attachment placed at the rear of the machine and usually adjustable withih a limited range. All engine lathes, however, are not provided with an attachment of this kind, although it may be desirable to use one of the machines occasionally for taper work. A simple attachment which can be used for this purpose is shown in Fig. 363.

The work *A* is held in a collet in the usual manner. The regular cross-slide of the lathe is removed and replaced by a special slide *B*. This slide is fitted to the dovetail on the carriage and a block *C* is so fastened that it supports a heavy coil spring *D*. The tool *E* is held at one end of the slide *B* in the proper position with respect to the center of the work. The tapered bar *F* is fastened to the headstock of the lathe, and is machined at *G* to an angle corresponding to the taper required. A block *H* is fastened to the carriage to act as a support for the taper bar and to prevent

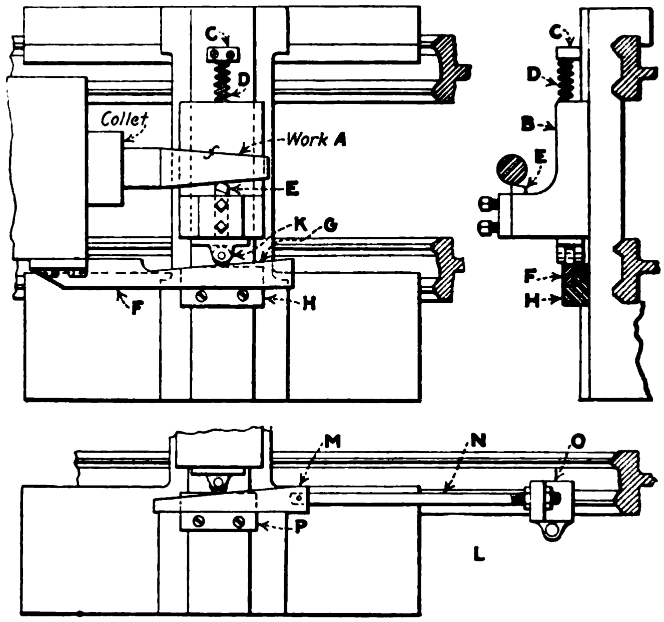


FIG. 363. SIMPLE TAPER ATTACHMENT FOR ENGINE LATHE

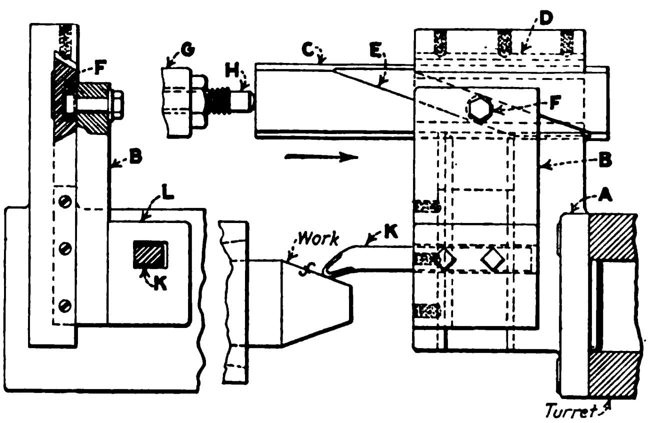


FIG. 361. SPECIAL ATTACHMENT FOR TURNING TAPERS

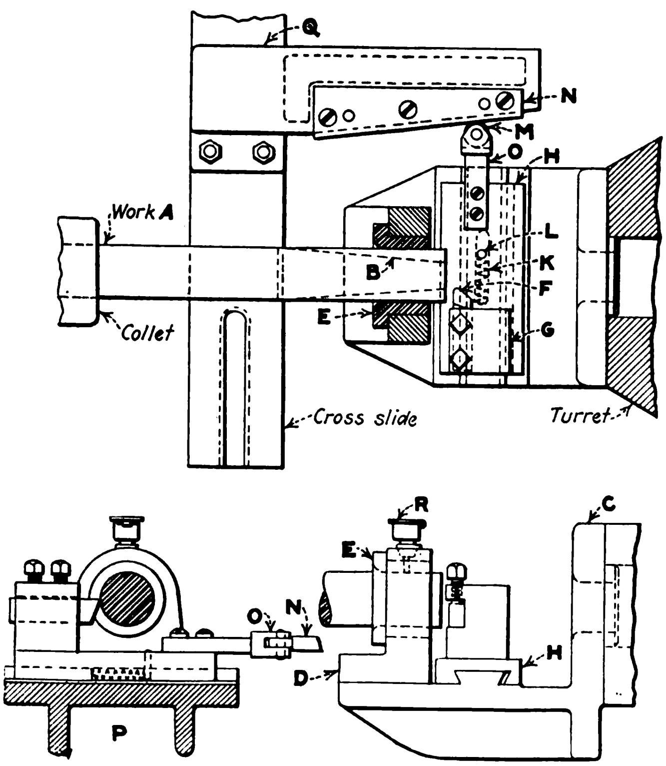


FIG. 362. TAPER GENERATING TOOL WITH SUPPORT FOR WORK

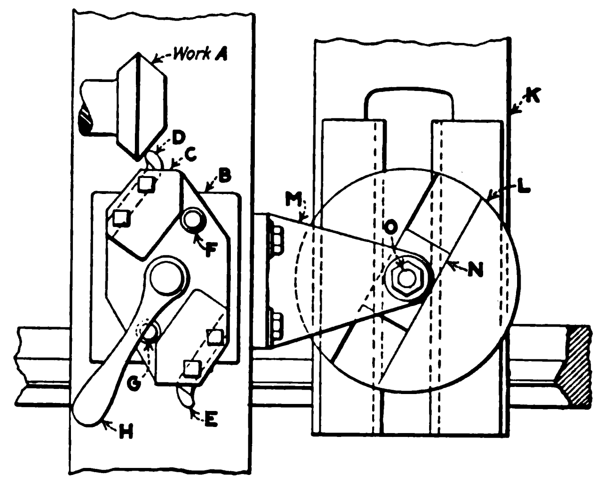


FIG. 364. TAPER TURNING WITH THE CROSS-SLIDE

it from being distorted by the pressure of the roll *K*, which is fastened to the slide.

In order to produce the taper it is only necessary to engage the longitudinal carriage feed, after which the roll travels along the taper bar and thus generates the taper. If for any reason it is inconvenient to attach the taper bar to the headstock of the machine, it may be applied as shown at *L*. The bar *M* is here attached to a rod *N* carried by the bracket *O*, which is fastened to the ways of the machine. The taper bar in this case is supported by a block *P* arranged in the same manner as that previously mentioned.

Taper work can be done by using the compound rest swung to the proper angle on an engine lathe, but when this is done it is necessary to feed the tool by hand. A turret lathe has no compound rest, and yet it is often desirable to use the cross-slide for turning a taper. The attachment shown in Fig. 364 can be used on either an engine lathe or turret lathe; the details of its application are slightly different in each case, but the principle remains the same. The work shown at *A* is to be beveled to an angle of 30 deg. and other work is to be done on it in the same operation. It is therefore desir-

able to do the work with the cross-slide and thus leave the turret free for other tooling.

A special block *B* is mounted on the cross-slide of the machine, and to it is fitted an indexing toolholder *C* somewhat similar in general construction to that described in a previous article. The tool *D* is used for roughing the angle, while that at *E* does the finishing. These tools are of the ordinary forged variety, so that they can be easily reground or replaced when worn. This turret toolpost indexes into only two positions, and these locations are controlled by a plunger in the bushings shown at *F* and *G*. A binder handle *H* locks the toolpost in either position.

The bracket *K* is fastened across the ways of the machine, and on this bracket is mounted a swivel plate *L* which is so arranged that it can be adjusted in a transverse direction. The angle can be changed by simply turning the disk around to the required position. Graduations for various angles can be conveniently placed on the base of the swivel, in order to make the setting easier. The cross-slide is provided with a bracket *M*, at the end of which is a block *N* pivoted on a stud at *O*. This block travels back and forth in the slot in the plate, thus controlling the angle of the taper. It is evident that the cross-slide must be left free longitudinally, so that it can adjust itself to allow the tool to follow the angle of the taper. After the cross-slide feed is engaged, the action of the device is automatic.

If a number of pieces of work are to be machined to various tapers and if the pieces are similar in their general shape, it is quite possible to design a taper-turning attachment with removable taper bars so that all of the work can be handled with the same attachment. When a designer is called upon to develop something along these lines, it is necessary first to determine the largest and smallest diameters which are to be machined. With this as a starting point, the range or capacity of the tool is predetermined; and it is only necessary to make sure that the methods of holding are uniform, in order that the method of machining will be similar in each case.

An excellent example of a progressive design of taper-turning attachment suitable for turret lathes is shown in Fig. 365. This attachment was designed particularly for handling a number of sizes of beveled pinions similar to the one shown at *A*. These pinions were of different diameters and tapers, and it was necessary to make the attachment in such a way that the angular surfaces would be generated accurately and without the necessity for making adjustments to take care of the different angles. The only way in which this could be done with certainty was to use separate taper bars for each angle, thus avoiding any chance of error which might otherwise be caused by a faulty setting.

The tools were designed for both roughing and finishing operations, two attachments being used on opposite sides of the turret. Only one of these attachments is shown in the illustration. The work *A* is held on a special expanding arbor *B* in the nosepiece *C* screwed to the end of the spindle. The body of the tool D is fastened to the turret face. Another tool body of exactly the same shape is on the opposite face of the turret; and a tie member *E* extends entirely across the turret and holds the tool bodies together, thus making a very rigid construction.

The slide *F* is held in place on the body by two flat straps *G* and *H*, and a taper gib *K* is provided on the side opposite to that taking the thrust of the cut, as shown at *K*. A separate toolblock *L* is fastened to the slide by means of suitable screws. This toolblock carries a turning tool *M* which generates the taper. The forward end of the tool body is fitted with a pilot *N* which enters a bushing in the bracket *O* on the headstock of the machine. This construction tends to stabilize the whole attachment when in operation. It also assists in obtaining accurate work, as it preserves the alignment so that there is no chance for variation.

Removable Taper Bar

The taper bar *P* lies in a slot machined at the back of the body of the tool. For convenience in machining the body is entirely open, but ribs on the top and bottom extend out and give greater rigidity. A reinforcing member *Q* is fitted between the ribs mentioned and bolted to the body of the tool at *R* and *S*, thus tying the units together and making them still stronger. There is a cored opening *T* at the rear of the slide; and the swivel block *U* projects through this opening, thus entering and being guided by the angular slot *V* in the taper bar. This construction is shown by the dotted lines. A heavy coil spring *W* is used to keep the block in contact with the slot in the taper bar. Adjustment for pressure is obtained by moving the

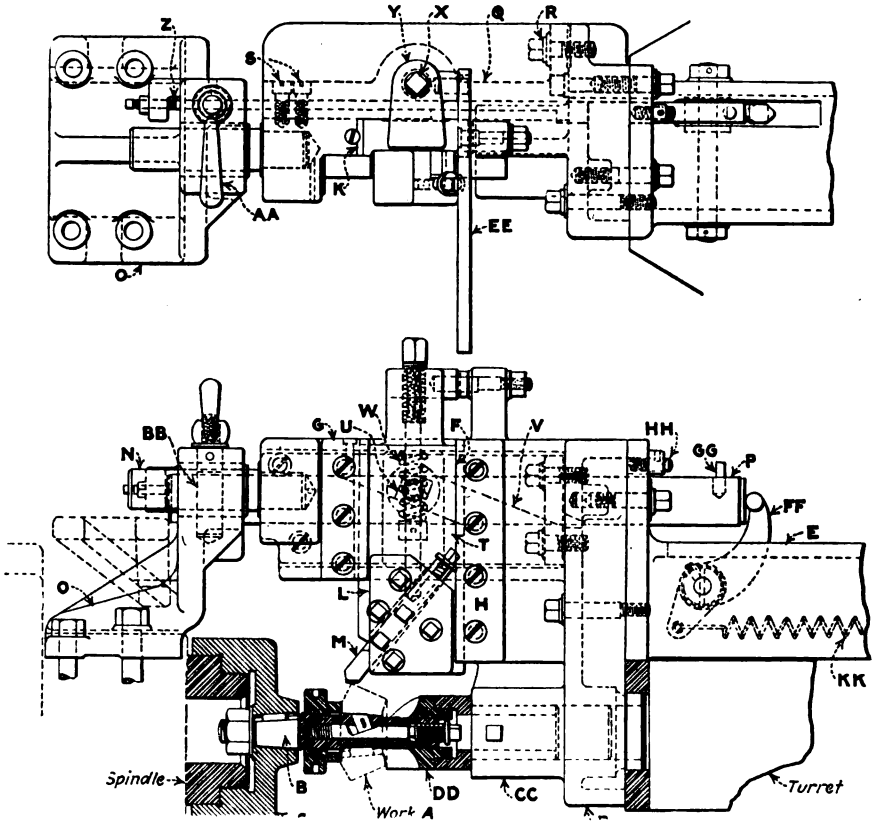


FIG. 365. SPECIAL TAPER-TURNING ATTACHMENT FOR TURRET LATHE

special screw X up or down as may be required. This screw is threaded into the overhanging lug Y on the slide.

The bracket O is slotted at one side to hold the taper bar. An end stop Z makes it possible to obtain fine adjustments for the bar, so that the angular portion will be in the right relation to the slide. The binder handle AA is threaded to the top of a cylindrical plug BB through a slot in which the taper bar passes. The various members of this attachment are cored out wherever possible in order to reduce the weight, but there is no sacrifice in rigidity.

Method of Operation

In operation the turret is brought forward until the pilot on the attachment enters the bushing in the spindle cap bracket O. It is carried forward sufficiently so that the end of the taper bar strikes the stop at Z, after which the binder handle AA is tightened. The feed is then thrown into engagement, and the tool moves forward while the taper bar remains still. The slide is controlled by the swivel block U which rides in the taper slot V, thus causing the tool M to generate the taper on the work. The hub CC on the body of the tool contains an angular face mill DD which is used to remove the stock from the cupped surface at the end of the gear blank.

After the taper has been generated, the binder handle is loosened and the entire mechanism drawn back away from the work. When this has been done the operator pulls down on the handle EE, thus relieving the pressure on the spring which controls the slide. This allows the kicker FF to act against the end of the taper bar, moving it forward until it is restrained by the pin GG coming in contact with the spring bumper HH. The coil spring KK exerts the pressure on the kicker. The turret can now be indexed and other tools brought into use on the work. The final cut is made by another taper turning tool exactly like this one.

The possibilities of this tool cover a wide range. The device was so designed that the toolblock L could be removed and a boring toolholder substituted for it, so that tapers could not only be turned but could also be bored to any size within the range of the attachment. Taper bars of various angles can be easily substituted to handle different pieces of work. The accuracy obtained on taper work with a device of this sort is fully equal to that which can be obtained on an engine lathe with a taper attachment. Attention is called, however, to the provisions made for adjustment and for handling various diameters of work. Naturally, as tools of this sort are somewhat expensive, it would not be economical to make anything of the kind unless the production were great enough to warrant the expenditure.

Nickel Plating Gas Engine Pistons

By Chester Lynndelle

The article by David Tyke, on page 287 of American Machinist, entitled "Nickel Plating Engine Pistons," is the first word the writer has ever seen in print on this subject.

Some five years ago a somewhat similar experiment was tried by the writer on the pistons of a twin-cylinder car of ancient vintage. Being of the horizontal-opposed type, it seemed that the pistons and rings wore more rapidly than those in a vertical-cylinder engine, as pistons were replaced at intervals of five to six thousand miles. Finally the cylinders wore so large that stock replacement pistons were unobtainable, when through the suggestion of a plater friend a coat of nickel was applied much as Mr. Tyke describes—except that there were some half dozen trials made before the nickel could be persuaded to "stick" properly.

After buffing the pistons to smooth out the irregularities of plating, the engine was reassembled and the nickel-plated pistons given a try-out. For about a month they gave fine service, and then, when the crankcase oil had become slightly diluted with kerosene, they cut out in just a few miles' running, knocking vigorously and setting up a series of groans that could be heard for blocks.

The Effect of Kerosene

Upon examination it proved that the kerosene had loosened up the glaze in the cylinder wall, and that the pistons had literally had strips of the nickel peeled off; fine, tightly coiled shavings, as though turned off with a diamond point, were found in the crankcase and in the combustion chamber.

After much tinkering and theorizing it was decided that the expansion of the copper facing used to bind the nickel to the iron was so much greater than the iron beneath that it had "crawled" sufficiently to start the trouble, and that the diluted lubricant had merely aided in the stripping process.

A further trial was made with a Schoop metal spraying gun, after the piston had been thoroughly cleaned of the old copper and nickel coat and roughened in a lathe. With the gun a coating of nickel was built up as a basis, after which electroplating was carried on as before.

The pistons enlarged by this method were still in service when the car was finally scrapped after some ten thousand miles of service as a delivery truck. To restore the cylinder wall gloss, graphite was fed in at intervals through a "gas-saver" opening in the intake manifold, and this in all probability was largely responsible for the excellent service secured.

Shall We Standardize Tapers?

THIS is a continuation of a general discussion on the merits of various tapers with a view to crystallizing sentiment in favor of one particular type. The first part of the article, published April 13, gave the opinion of some thirteen manufacturers. Other opinions on the subject are as follows:

No. 14. Years ago—how many, I am afraid to say—a contributor to AMERICAN MACHINIST wrote under the name of "Jarno," and among the good things offered by him was the Jarno taper. It always seemed to me to be the most consistent system in the way of tapers for a standard that has ever been proposed. I cannot help but think that if the mechanical world at that time had recognized the value of standardization as it does today, the Jarno taper would now be the standard, and in universal use. If a good mechanic, foreign born and educated to the best standardization ideals, were to suddenly find himself transplanted to the United States, he would certainly be amazed at our adherence to odd ideas concerning so-called standards that never were right. He would wonder at our sentiment, selfishness, and general shortsightedness in not moving straight ahead toward an economy always followed by proper standardization.

In my experience, I have found that anything for which any of the commonly used tapers is satisfactory would be equally satisfactory if the Jarno taper had been substituted. Standardizing tapers would, however, be a much more difficult problem today than at the time the Jarno taper was proposed, although the same or more proportionate advantages would be obtained. The cost to manufacturers would be many times greater at the present time if we consider the increase in tapers in use.

If the Jarno taper were considered at the present time as the standard, there would be more opposition from the general public because it is little known, and this would require replacing the two well-known tapers, Brown & Sharpe and Morse.

Twenty-five years ago, there were many more tapers in use than at present, and the need for standardization was more apparent. Today the Brown & Sharpe and Morse tapers greatly predominate, so that the choice of a standard in the part of the mechanical world with which I come in contact would be from among the three mentioned.

The records of our factory show that we have 721 machines with the Morse taper, 327 machines with the Brown & Sharpe, and 23 with the Jarno. A great many of these are ordered with Morse tapers regardless of the makers standard. We have a great many so-called adapters which transform one system to the other, and we can thoroughly appreciate the economy and convenience of one standard. We could standardize on the Morse taper at a less cost than any of the others, and it would suit our particular business better, if, of course, the drill shanks remained as they are. If, however, the shanks of drills conformed to a new standard, this feature could be neglected.

The cost of standardizing on Brown & Sharpe would be greater than for the Morse, merely because of the number of machines. If the Jarno were to be standardized, the cost would probably be more than for the other two on account of the greater number to change. This change, in some of our machines, would not be very serious, because the Jarno taper is so near the Morse, and in many cases the diameter at the point is not so essential for the interchange of fixtures as the diameter of the hole at the nose of the spindles and the taper.

If the majority of the manufacturing public of the United States should vote to adopt the Jarno taper as standard as fast as possible and use their influence wherever possible to get it into use, I believe that the cost of the change would be offset in a few years, and we would wonder why we ever questioned the advisability of it.

Two Favor Morse, One Jarno

No. 15. We are advocates of the Morse taper, basing our opinion entirely on the production machines in our plant. We believe that this is the most common taper in use and see no reason why it should not be adopted as the standard.

No. 16. As the Morse taper is more generally used and almost exclusively adopted for all sizes and styles of drill presses, lathes, and turret lathes, we advocate this taper.

No. 17. We have adopted the Morse taper and are equipping all of our machines with it unless otherwise specified. We have been requested to furnish machines with Brown & Sharpe and Jarno tapers, but it is certainly more or less confusing to make these changes, and we would heartily endorse the adoption of a single standard, preferably the Jarno.

No. 18. There seems to be no question but that a single standard would be of great advantage. The writer's preference would be the Brown & Sharpe taper; this on account of its uniformity and also having been standard in so many tools. We might add that we are using the Brown & Sharpe taper in our automatic gear cutting machine and Morse taper in our lathes, conforming to the usual practice.

No. 19. We believe that there should be a fixed standard for tapers. In order to obtain as near this result as possible, we are limiting our purchases of machine tools to those using standard Brown & Sharpe tapers, which we believe to be sufficiently satisfactory for all mechanical purposes. On account of our greater experience with Brown & Sharpe tapers, we are not in position to state the advantages of the Jarno standard. We do, of course, use Morse tapers for all of our drilling machine work, but do not believe they are as well adapted to other machine tool spindles as the Brown & Sharpe.

Economy Follows Standardization

No. 20. If there is any advantage in the different tapers it is very slight. To pick out the taper which should be adopted as a standard would be an easy matter. There are a great many machine tool builders who still believe that they could control the market in their particular type of tool, simply because they are using a certain taper in the spindles, and it surely would be to great advantage, not only to the consumer but to the manufacturer, to have a standard taper adopted for all spindles. This is followed out to some extent in milling machines, lathes and drill presses. We believe economy always follows standardization.

No. 21. Our own practice is somewhat varied as we use Brown & Sharpe tapers up to No. 14 in our small and moderate size machines, and in the larger sizes we use tapers that are standard in our own shop only and which were the original tapers before our adoption of the Brown & Sharpe. In our particular line of manufacture we do not see that there would be any great advantage in changing now to one standard, as the arbors made for our machines are seldom if ever used on any other makes of machines. We are thoroughly in sympathy with the standardizing program, however, and are finding it to our advantage in other features of our design to study this point much more closely than ever before.

No. 22. Modern milling machines are equipped with Brown & Sharpe tapers; drill presses, radial drills and boring mills with Morse tapers. Brown & Sharpe tapers are more consistent in their design than the Morse, being 0.500 in. to the foot, disregarding the number of the taper, whereas the Morse varies from 0.602 to 0.625 in. without apparent reason.

The Brown & Sharpe taper having a smaller included angle is better suited for milling machines, gear cutters or any other type of machine, where a great side thrust is exerted. This side thrust has the tendency to cause the tapered end of the cutter arbor to work loose. The Brown & Sharpe taper has a greater frictional driving power than the Morse. In modern milling practice for heavy duty, this condition is not taken advantage of as the driving is done through a flange located at the front end of the taper. The

practice of driving through a tongue at the small end of the taper should be discontinued except in the case of small end mills and small arbors for light duty.

All our gear-cutting machines for the trade are equipped with Brown & Sharpe tapers. In our milling machine department we have adopted No. 11 and No. 14 Brown & Sharpe tapers as our standard; in both cases the driving is done by a flange located at the base of the taper fitting directly into the spindle of the machine. Everybody has trouble with tangs of drills breaking, due, we believe, to having Morse taper shanks. It is our belief that drills with Brown & Sharpe tapers would eliminate that condition to a great extent.

Uses Many Tapers

No. 23. With regard to the merits of the Brown & Sharpe, Morse or Jarno taper, the writer has the impression that it would be a blessing to the country if any one of them had been adopted ten or twenty years ago and the others forgotten. In the design of our machines we use a number of different tapers. For instance, we are using a taper of 1¼ in. per foot (more than twice that of the Morse) for the spindle bearings in our wheelheads, as this allows us to take up wear in a most satisfactory manner without making too much end-wise adjustment.

On the other hand, in the case of some of the smaller wheelheads where we wish to mount quills of small sizes, we have used one of the small Brown & Sharpe tapers because they have quite a wide variety of sizes as compared with the Morse, or, as I remember it, with the Jarno. There we are limited with regard to the size of the hole which we will drill in the end of the spindle and the designer has more of a choice of tapers by using the Brown & Sharpe where the large diameter is in the neighborhood of $\frac{5}{16}$ or $\frac{3}{8}$ inches.

No. 24. It is our impression that the Morse taper is in more general use than any other and we believe its adoption as a standard by all machine tool builders would be a good move.

No. 25. We are very much set on the Morse taper as far as our shop equipment and the machine tools we are building are concerned. In fact we specify nothing else but Morse tapers. We believe that the Morse taper is in more general use than any of the others. There is no question as to the economy as well as the convenience of having a single standard among machine tool builders, but it would mean a very great expense to use to use anything else but the Morse taper. In fact we would like to change over to anything else from the Morse taper about as well as we would like to change from our present system of measurement to the metric system.

No. 26. Ever since we have been in business we have used tapers which were current at the time we started out. We have never, except in one instance, adopted any of the standard tapers as a regular thing. In one line of machines which we started to build, we adopted the Brown & Sharpe taper, as probably representing more nearly the standard practice of machines of the general type that we were building. We did not change the taper in our older established lines. The experience that we had with the Brown & Sharpe taper in that one line of machines did not give use sufficient data to work from to determine whether or not it would be advisable to attempt to adopt such tapers for all machines. We expected, in adopting this taper, to be able to buy standard shanks and collets that we could use on our machines, but we found that the proportion of the standard items we would buy was so small as to be almost negligible. In nearly every instance, owing to the special nature of the tools to be used, they had to be made, so that really the taper had very little to do with cutting down the possible expense.

Likes the Jarno

No. 27. If it were a question of starting all over again and disregarding all existing tools, etc., we should prefer the Jarno taper as it seems to be ideal on account of its simple formula and uniform taper. However, this condition does not exist, and the next best standard is the Morse taper. For drill presses and lathe centers it seems there can be no objection to the Morse taper, but for milling machines, we would prefer the Brown & Sharpe half-inch taper per foot. As most shops have Morse taper reamers and gages, it would be less expensive and more satisfactory to adopt the Morse taper as standard.

No. 28. Although our product does not require taper sockets of any kind, still we would be only too glad to see some taper adopted as a standard for lathes, drills, millers, etc. We have about four different tapers in our plant and they cause very much confusion and an added expense in carrying so many drills etc., to fit them. All three tapers you mention have their merits and defects. The Brown & Sharpe is very good but being so much longer than any of the others, it requires that much more material for all bars, cutters, drills etc. This item alone would condemn it in many cases.

The Morse taper we find is too abrupt as the sockets have a tendency to fall apart; and then every Morse taper has a different degree of taper, making it hard to remember when turning bars, drills, etc.

The Jarno, while it has the faults of the Morse to some extent, has the advantage of being dimensioned in a very simple manner and the number of the taper can always be told by measuring the ends or length. While we do not think Jarno is the best, we think it is a step forward and if a happy medium between a Jarno and Brown & Sharpe could be found, we think it would fill the bill.

No. 29. We agree that a lack of uniformity on tapers leads to confusion and the multiplication of tools and arbors. We also agree that because of this there is an unnecessary waste which could be avoided by having a single standard.

Our experience shows that the Brown & Sharpe taper is satisfactory for milling machines. We believe manufacturers have in the past been using too small sizes or numbers of tapers in the different sizes of machines and which did not allow enough area in the surface contact.

We feel that the Brown & Sharpe taper holds somewhat better than the Morse on account of its small taper per foot. This same argument would hold good against the Jarno, which is almost the same taper per foot as the Morse.

Wonders at Morse Variations

No. 30. Not being familiar with the history of the development of the Morse taper my deductions may be wrong but it seems to me that the original tapers, because of the lack of proper facilities, were turned and the error in them standardized. I cannot conceive why the tapers should have varied from 0.600 to 0.630 in. Surely this cannot have been the result of an attempt to make the tapers vary with the idea that it would be better suited to the diameters involved.

The Brown & Sharpe taper would, in general, be satisfactory were it not for the fact that the No. 10 taper varies from all the rest, and I cannot understand why this is so. The nearest approach to a sensible system is reached in the Jarno tapers.

A uniform taper per foot should be established for drill shanks, lathe centers, milling machine arbors, etc., and the sooner this is done, the better. I dare say that drills with taper shanks would not have their tangs twisted off so frequently if a taper of ½ in. per foot were standardized. This subject really deserves very careful thought, but whether a taper of 0.50 or 0.60 in. per foot is finally adopted, it should be made uniform throughout for all sizes. I have always looked upon the Morse taper as a perpetuation of an error.

No. 31. We use the Brown & Sharpe taper because it is a straighter taper and hence better adapted to the use of end mills. It has been our experience that in using a Morse taper with end mills that the strain on the side of the cutter tends to loosen it in the spindle and the straighter taper of the Brown & Sharpe overcomes this difficulty.

No. 32. We believe that the taper to adopt would be the Jarno, owing to its being based on a formula easily retained in one's mind. We believe the adoption of a single standard an excellent idea, and even if plants would adopt

the slow process of having their new tools and replacements carry the taper adopted as standard, it would only be a matter of a few years until the standard taper would become generally adopted.

No. 33. From our standpoint, the Morse taper seems to be best, although we admit that its start was on a wrong basis, with reference to uniformity. However, it has been so widely adopted throughout the world for certain classes of machinery we do not see how it can be changed. The same thing may possibly be true of the Brown & Sharpe taper, but not to such a degree. The Jarno is based on a uniform basis, but is only a little known and not much used. We do not believe that you can ever reconcile users and manufacturers at this stage of the game to a uniform taper. You will meet such tremendous opposition from well-known sources, and from unexpected sources, that it will be impossible to bring this about. Something like trying to change from English to metric system, only not so bad.

Three More Jarno Advocates

No. 34. We are inclined to favor the Jarno taper because it is constant instead of changing. In this we feel it is superior to the Morse, and it has a somewhat greater included angle than the Brown & Sharpe. We think this better since it has been our experience that the Brown & Sharpe taper seats in too binding a manner at times.

No. 35. Our opinion is that the Jarno taper would be the best to adopt as a standard, the reason being that the Jarno formula is simple and uniform. We firmly believe that one standard taper would be a great convenience, as well as an economy.

No. 36. It seems as though when we are designing fixtures for our various lathes, we find that no two of them have the same taper in the spindle nose, a feature which limits the use of tools and increases the number of tools necessary. In our own manufacture of machines and tools we use only the Morse taper, and have found but one instance in which this taper could not be adhered to. That was a case where we wanted a size that came between the No. 4 and No. 5 Morse.

Personally, I believe that the Jarno taper would be the best to adopt for universal use, but it would mean a great expense to everyone like ourselves who have already standardized on the Morse or other tapers. However, we realize that it costs real money to make improvements and we would be glad to do our part along this line in co-operation with other manufacturers, if a suitable taper is decided on to cover all conditions.

No. 37. Our work is coming more and more to be in the drilling and boring lines only, so that we rarely furnish anything but Morse tapers. It seems to us that a standard taper for drilling, boring and milling machines, lathes, etc., would be desirable, but whether the cost of changing over would more than overcome the advantages, I am not prepared to say. We would be willing to abide by the decision of the majority and adapt ourselves to whatever seemed to be the most advantageous.

No. 38. We now use standard Morse tapers in the spindles of all our lathes and prefer to hold to this taper. As we understand it, most of the machine tool builders, or rather a large majority, use the Morse standard taper.

No. 39. As the situation stands now it is quite a nuisance to worry about three different standards, and personally I think it unnecessary, as all three standards are good and any one of them could be adopted. For simplicity sake, we are in favor of Jarno tapers, as it is simple to remember and the taper per foot is the same on all sizes.

The writer has also been advocating the standardizing of such parts of machine tools that hold the work and the tools. For instance, in the lathe a standard taper in head and tailstock spindle and standard size toolpost. On a radial drill, a standard diameter of spindle nose, as well as taper, standard T-slots for the table, etc. Of course, there would be a standard for each different size. We are very much in favor of standardizing and would adopt anything within reason along these lines.

(*To be continued in next week's issue.*)

Core Plugs and How to Make Them

By A. J. Langhammer

"Core plug" is the name by which the peculiar type of expansion plug described in this article is known to mechanics and engineers. The title has become a fixture with this plug, because of its almost universal adoption for plugging core holes in the water jackets of automobile cylinders.

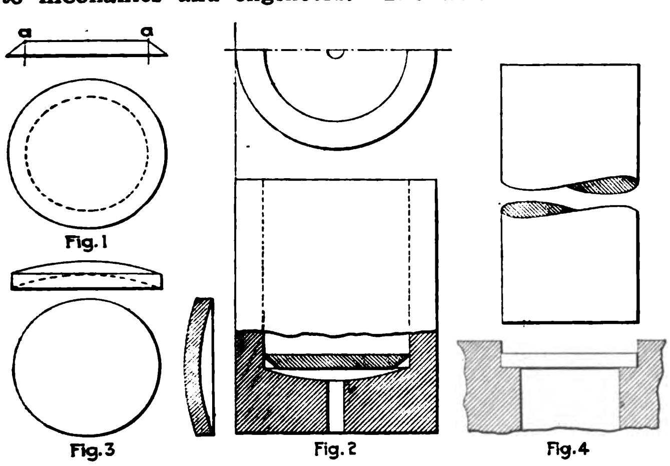


FIG. 1. THE CORE PLUG. FIG. 2. FORMING DIE WITH CORE PLUG IN POSITION FOR FORMING. FIG. 3. CORE PLUG AFTER FORMING. FIG. 4. PASSAGE SEALED BY A CORE PLUG

A core plug for a 1-in. hole is shown in Fig. 1, which pictures at a glance the small amount of metal used. The labor cost of manufacturing is very low as is the cost of application. The writer has used core plugs on cast iron, carbon and alloy steels and for these materials cold-rolled steel in bar stock or low carbon steel in sheet stock has proved the most satisfactory. For a limited quantity it is best to make the plugs on an engine lathe to the shape shown in Fig. 1 and care should be exercised to make the base or largest diameter with a sharp edge so that it will "bite" in. Fig. 2 shows a die with a core-plug in position for forming. In Fig. 3 is shown a finished core plug, which with the sectional view in elevation is very clear.

In Fig. 4 is shown a plugged oil passage in a section of a crankcase with a core plug driven home. Immediately above is shown the "set" which is merely a short piece of cold-rolled stock with squared ends, and which with a machinist's hammer comprises the only tools necessary for assembling. At the first glance the strength of such a joint is not apparent. It is therefore necessary to again refer to Fig. 1. Here it will be observed that the metal shown in the small triangles *a, a* which, in the plain view, is the area between the dotted and the full circle, really forms a caulking medium. This is obviously a huge amount of metal and when driven in place, as shown in Fig. 4, forms a very strong and durable joint.

The writer has used core plugs on machine tools, fixtures and automobile parts and in diameters up to 2¾ inches.

Machine Operations in a California Pump Shop

Adaptable Shaping Fixture for Pump Brackets—Operations on the Vertical Turret Lathe—An Interesting Milling Operation—Turret Lathe Work

SPECIAL CORRESPONDENCE

THE illustrations shown herewith represent methods of manufacturing centrifugal pump parts in a factory in the Sacramento Valley.

The halftone, Fig. 1, shows a shaping operation on the base of a pump bracket. The work is here shown mounted in a special fixture in a Gould & Eberhardt 28-in. shaper. This fixture is adapted for holding all sizes of brackets, and to make the change from one size of bracket to another it is merely necessary to change the adapter plugs at the ends upon which the bracket is hung up for the shaping operation. This is brought out clearly by the detail photograph, Fig. 2, which shows the fixture and the bracket on the shop floor with several adapter plugs and collars in the foreground.

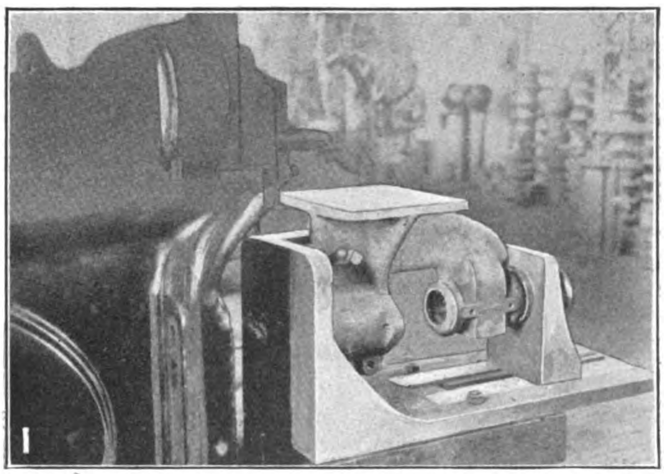
The bracket casting is bored out on a horizontal machine, and when it comes to the shaping operation, the proper head plug is inserted in the upper end of the fixture where it is secured by three hexagon head capscrews tapped into the flange around the base of the plug. The adapter rings for the handwheel screw at the right-hand side of the fixture are slipped over a sleeve which is tapped out to receive the screw for the handwheel. A washer and screw hold the adapter collars in place. For general adjustment to length to suit different widths of brackets, the outboard support for the work is adjustable longitudinally on the base and secured at any point desired by a square-head bolt sliding in the T-slot in the casting.

The two lugs at the top of the left-hand upright on the fixture carry setscrews which bear against the walls of the bracket to bring it into level position crosswise for the planing operation.

The drilling of the bolt holes in the base of this type of bracket is accomplished, as shown in Fig. 3, with the aid of a jig which is also arranged for taking care of various sizes of brackets. Details of this jig are clearly brought out in Fig. 4. The jig consists of an angle casting, in the upright of which is fixed a horizontal post, over which are fitted adapter sleeves to suit all sizes of brackets. In the rear wall of the upright leg of the jig casting there is a guide slot to receive the guide at the end of the different jig plates. A clamp screw and stud provided at this point secure in place whichever jig plate is used on the job. Referring again to Fig. 3, the bracket to be drilled is slipped over the locating sleeve in the jig and tightened upon this holding sleeve by means of a C-clamp, which is gripped upon the bosses at either side of the slot cut through the main bearing. This binds the work upon the sleeve, and the outer end of the casting is supported at the same time by a short jackscrew placed as represented in Fig. 3. The work is handled under a radial drill as shown in Figs. 3 and 4.

The casings or bowls for centrifugal pumps are bored through the wall and faced at the side for the joint surface in the manner illustrated in Fig. 5, where the job is shown on a Bullard vertical turret lathe, with the casting resting on and gripped in the four jaws on the table. With the work in this position the various turret tools are brought into action one after another to bore out the casing, rough and finish the large opening in the top of the casing, and to rough and finish the joint face on the outer surface. With the surface referred to finished as indicated, the bowl casting is ready to be machined across the face of the flange. This latter operation is attended to on a big milling machine, with the work placed over a locating ring which is mounted upon the table of the miller. This locating ring is another form of adapter which fits over a central plate secured to the milling machine table. The plate carries a vertical stud with suitable clamps and quick acting nuts to hold the work down in place. For the different sizes of pump casings, the adapter rings referred to above are changed by merely slipping them off from the central plate and replacing them by the ones required, so that the simple arrangement of very few parts takes care of all sizes of casings.

The actual milling of the flange face is accomplished with a large inserted tooth milling cutter, carried on the nose of the spindle.



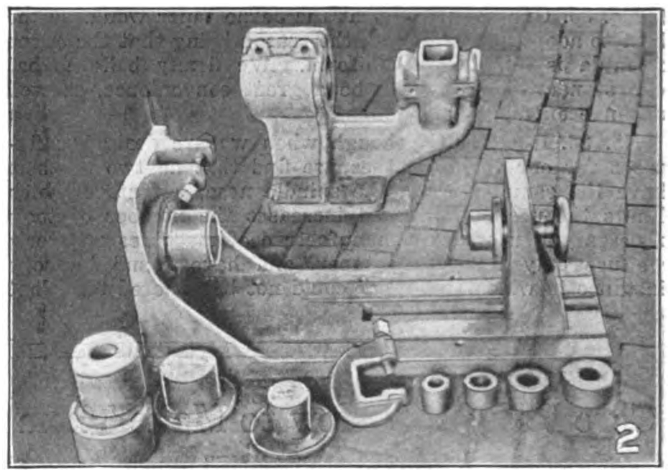


FIG. 1. PUMP BRACKET IN THE SHAPER. FIG. 2. SHAPER FIXTURE FOR PUMP BRACKETS

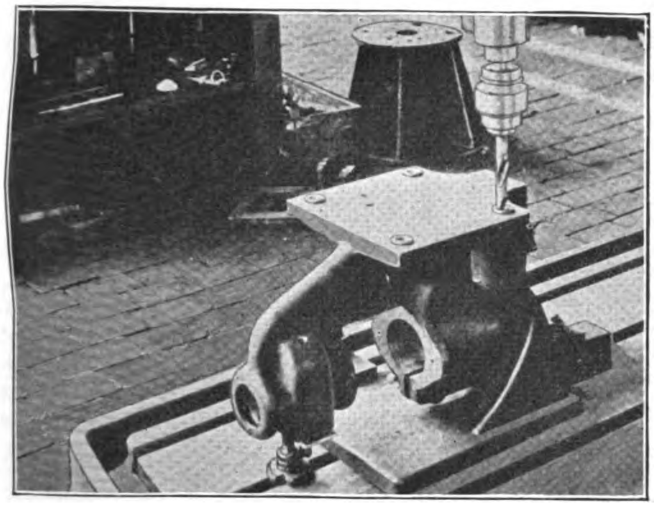


FIG. 3. DRILL JIG FOR PUMP BRACKETS.

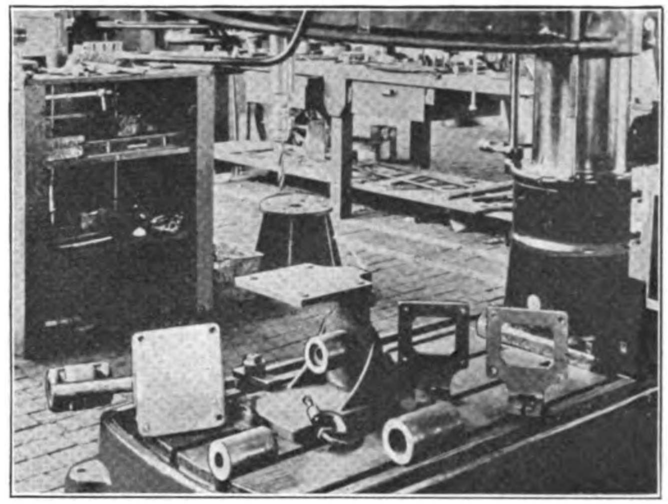


FIG. 4. SET OF AUXILIARY JIG PLATES FOR BRACKETS

On this make of pump there is used a combined elbow check valve which has a cast body with three faces at different angles to one another, as shown in Fig. 6, where two of these castings are seen in place in a special fixture on the table of a horizontal boring machine. The method of facing the round flanges at the ends of the elbow proper is to mount the work upon the angular fixture, as illustrated, and accomplish the surfacing by means of a milling cutter on the horizontal spindle. The fixture itself has two sloping faces at the proper angle to suit the elbow to be machined. While one casting is undergoing facing operations, another casting can be clamped in place on the opposite face of the fixture. Thus little time is lost in the process of removing finished work and replacing it with rough castings, as the handling of the job into place is going on at the time the cut is being taken on the opposite piece of work. The method of securing the baseplate of the fixture to the boring mill table and the means for clamping the upper or movable part of the fixture are easily seen in the illustration. The milling cutter on this machine has a 10-in. body in which are inserted blades of high-speed steel, these blades measuring 2 in. long, 1 in. wide, and $\frac{3}{8}$ in. thick. The cutter is one of many sizes made at the plant and used for a variety of purposes in the production of pump members.

The combined elbow check valve is seen undergoing another operation in Fig. 7. Here it is shown set up on the shaper for the surfacing of the end flange. The fixture upon which the work is mounted for this operation is a peculiar form of angle iron, the wings of which are finished at the necessary angle with the base to locate the check valve elbow with the top surface in the horizontal plane. Thus without adjustment of the work upon the fixture or of the fixture upon the shaper knee, the top of the casting is in proper position for finishing, as soon as a couple of C-clamps have been applied to grip it securely in place.

Turret Lathe Work

A good deal of the work at this plant is accomplished in the turret lathe and a view of a Steinle machine in operation on spiral covers is shown in Fig. 8. These covers for different sizes of pumps are handled by boring out the hub and finishing to size and then slipping over a locating plug which is carried in the spindle of the lathe. Through this plug extends a draw-in bolt which has a nut at the outer end and an open washer as shown in the illustration, so that the removal of the work is accomplished very quickly and new work is rapidly put into place. The tools and the turrets are shown distinctly and their general character will be appreciated without detailed description.

Many classes of jobs are handled on this type of machine, including among other items the impellers or runners for the pumps which are chucked and machined in practically the same way as the spiral covers illustrated. In connection with the runners just referred

FIG. 5. BORING OUT A PUMP CASING.

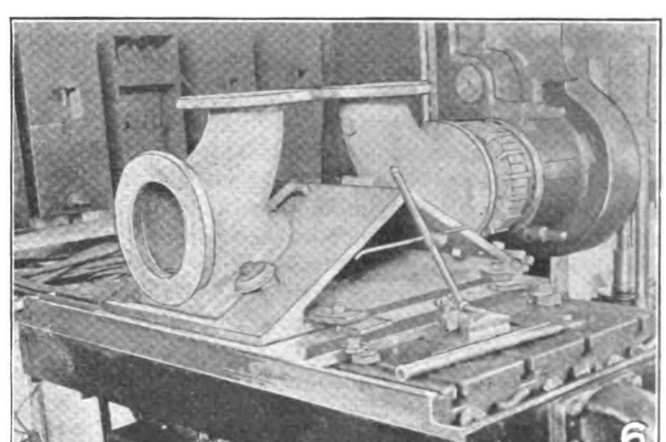


FIG. 6. MILLING COMBINED ELBOW CHECK VALVES

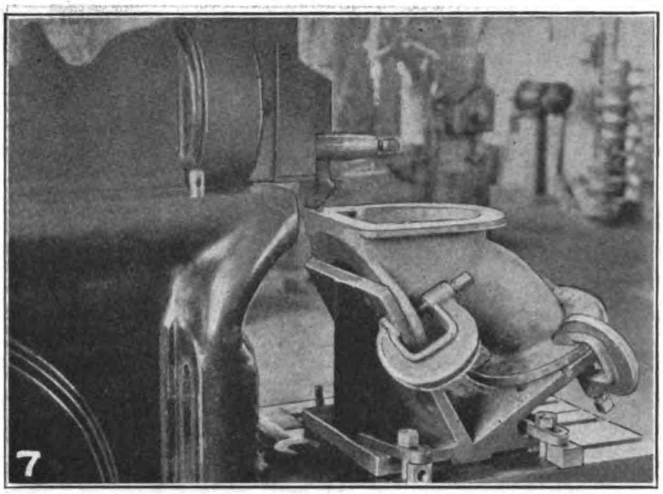


FIG. 7. SHAPING COMBINED ELBOW CHECK VALVES.

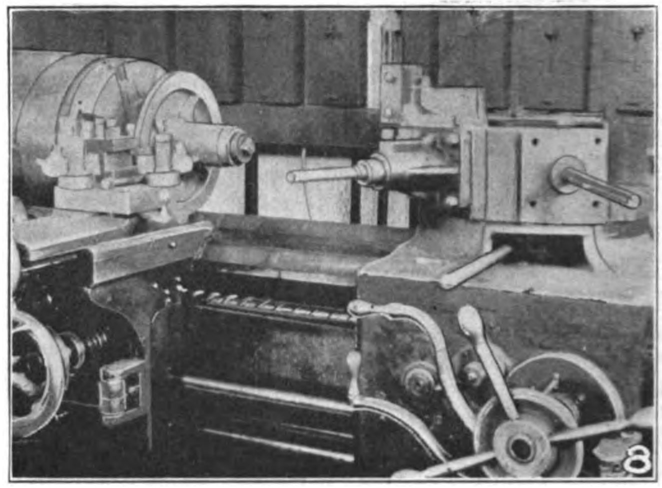


FIG. 8. PUMP COVER OPERATIONS IN THE TURRET LATHE

to, one interesting process which is carried out under a radial drill is the facing of the inner end of the hub. The other surfaces are machined after the job is set up in the turret lathe, and for the squaring off and finishing of the inner end of the hub, the casting as it comes from the lathe, is placed over a fixture under the radial drill, this fixture consisting of a circular plate with an upright post over which the work slips freely. A cutter bar is brought down with the spindle of the drill, and a flat cutter carried by the bar faces off the end of the hub to the desired dimension.

The illustrations presented in the foregoing article are selected from the many interesting features of practice at the shops of the Superior Manufacturing Co., Lodi, California.

Railroads Need Business Methods

By C. J. Morrison

The article by Herbert Hoover, Secretary of Commerce, on page 262 of American Machinist, is very important and instructive. But one point should not be lost sight of, overlooked, hidden, or forgotten—and this is that the railroads are inefficiently operated in practically every department. This is not because the officials are incompetent or indifferent; nor is it because they are not working hard and conscientiously, but it is because they are terribly handicapped. There is probably no body of men in the world more able or hard working than our railroad officials, but they are handicapped, not only by numerous laws and regulations, but also far more seriously by the fact that railroading has been conducted as a business within itself.

In other industries there is a continuous exchange of employees and executives from one industry to another with a consequent exchange of ideas and methods, but the railroads seldom receive an employee and practically never get an executive from another industry, while the exchanges from one railroad to another are not very great. Even though there was a considerable interchange among the railroads, little good would be accomplished as the methods are similar on all railroads. The result is that the employees and officials are in a rut and are so steeped in tradition and prejudice that it is almost impossible to affect improvements.

To illustrate the point, consider an example familiar to every one. Many years ago in the days of the link and pin couplers, single track operation, no air brakes and no block signals, it was necessary to place on the rear ends of trains flags by day and lanterns at night. Today hundreds of thousands of dollars are spent by the railroads every year to maintain these things which, in all but a very few instances, are utterly useless. Incidentally, the railroads would not adopt the automatic couplers and air brakes until they were forced by law to do so, and they tried in every possible way to prevent the passage of these laws.

Henry Ford showed what can be done with a railroad by someone who, with no railroad experience, managed a railroad like any other business. Not only has he made his little road pay, but he has increased wages.

A railroad is a hard business to supervise and is so full of trials and tribulations that officials are too everlastingly busy with their daily problems to think much about economies. Each railroad needs an executive who could devote his entire time to the various problems to affect economies, and he should be a man with a broad experience outside of railroad work. There is no need for the Taylor or any other particular system, but rather the application of good common sense and outside business experience is required.

Probably the greatest money waster is the mechanical department, due partly to the fact that it is an expense department and therefore neglected, and partly to the lack of other than railroad experience by the employees and officials. It is so hard to get an appropriation for the mechanical department that the shops are full of antiquated machines and devices. The employees from this department are so notoriously slow that few outside concerns will hire them if others can be obtained. Let some courageous railroad official secure for one of his shops a high-grade superintendent from outside the railroad, give him the equipment he asks for and see what he will do to the repair bill for locomotives and cars.

In this connection it may not be out of place to say that such a superintendent will demand 50 to 75 per cent more salary than is usually paid for the position. Railroad officials are notoriously underpaid and this is another handicap. Railroads train many men only to have them leave just as they are becoming valuable.

The railroads certainly should be run as other business enterprises are, and this criticism is written with the hope that it will not add to the handicap, but that it may arouse some thought on the subject and may accomplish some good.

Selling Engineering Service

By Alex Dowel

The salesmanship required in selling any form of engineering service is of a highly specialized nature and it cannot be classed with the selling of a concrete article. The salesman must be more than a canvasser who introduces a certain kind of goods, and should be considered as a combination of salesman and engineer.

In the salesman for engineering service—consulting, industrial, or production—two important points are required: First, a full knowledge of the service he is selling and second, implicit confidence in the firm for which he is working and its ability to render adequate service to the client. It is vitally necessary that the feeling of confidence be inspired in the salesman as otherwise he cannot influence a client in the right direction and imbue him with the necessary confidence in his firm.

Let us suppose that a consulting mechanical engineering firm specializing in production methods requires the services of a salesman to introduce its engineering service to various manufacturers of mechanical products. The man selected for this job should be one who has some knowledge of general shop practice so that he may be able to talk intelligently about it. At the same time the salesman need not be a strictly first-class engineer who has specialized in the particular line with which he is associated. The ability to sell and to impress the customer is more important by far than a knowledge of engineering. Past experience which enables the man to talk intelligently about the general conditions governing the work is a valuable asset and should generally be considered as an important factor in his selection.

If a reamer, tap, die or other small tool is to be sold the salesman usually has a sample, but in selling engineering service he is selling the service of a professional man and may be classed as a salesman of "brains." It is easy to show a man a suit of clothes and land his order but to sell "brains" to him is not so easy. Yet a competent sales engineer with the right qualifications can do it—can, at any rate, influence the sale and bring the client to the point where he is willing to talk with the consulting engineer regarding his problems.

In the writer's opinion the salesman's principal business is to get in touch with firms requiring the kind of service his company is able to furnish and *to make the client eager* to have a talk with the engineers in charge of the work.

Qualifications

The sales engineer who attempts to sell engineering service must have qualifications that resemble those of an ordinary salesman, yet different because it is necessary in this class of work to be more familiar with important details. The following list notes briefly the various qualifications: (1) Ability to sell service; (2) knowledge of the service that he is selling; (3) personality; (4) knowledge of character; (5) diplomacy; (6) honesty and conscientiousness; (7) understanding to enable him to meet competitors; (8) understanding to enable him to adjust losses and generally to render satisfaction to the customer; (9) ability to market the service at a substantial profit.

I have mentioned the ability to sell service first. A salesman may be a competent engineer and yet may not have a sufficient flow of language to express himself properly and inspire confidence in the client. The ability to talk is therefore a valuable asset in a salesman but he should not by any means acquire a reputation for "gab." The experienced man will gradually lead his client up to the various points with which he wishes to impress him and he will do it in such a diplomatic way that it will not appear on the surface.

A great deal of harm can be done to an engineering firm by a salesman who creates an unfavorable impression, who makes statements as to current practice which are not in accordance with good engineering ideas. The man who understands his business will answer questions up to the point where there is some uncertainty in his own mind and at that time he will state that this phase of the situation is out of his line but he will be glad to refer it to one of the firm's engineers. Technical questions can usually be disposed of in this way to the advantage of all concerned, as they will then be brought up before the right man and accurate statements made which will be of assistance to the client. No salesman should be afraid to say that he *does not know* just how a certain matter would be handled, as he is not supposed to be a consulting engineer but rather a salesman. Neither is he supposed to go about the country and give out valuable information without charge, although it is perfectly legitimate for him to do all he can to assist a client when there is a prospect of making a friend.

Aggressive Diplomacy

The personality of the salesman enables him to obtain an interview with executives so that a statement of service can be presented to the parties most interested and most influential in turning the business in the right direction. Men with the qualifications of intelligence, energy and honesty and having good address will make a success in salesmanship while the quiet and unassuming man will often lose by a lack of assertiveness, so that he will miss a great many interviews which a more energetic salesman would obtain. Dignity should not be sacrificed and the aim should not be to obtain a reputation as "hail fellow, well met" because this attitude is likely to result in the impression that the firm represented cares more for the frivolous things of life than those which are serious. The ability to judge of the character of the executive with whom he is talking and to use diplomacy in his talk with him is a decided advantage to the salesman. A straightforward manner of talking, which is at the same time not too abrupt, gives the impression of honesty and will oftentimes enable a man to obtain a long interview, when any tendency toward concealment would leave a different impression unfavorable to the firm.

Another point of importance is the ability which a salesman should have in giving satisfaction by the adjustment of any losses that may have occurred during the progress of the work. This matter calls for the use of considerable care, yet at the same time it must be combined with business judgment in order to place the fault where it belongs without giving offence. It may be a matter of hundreds or even thousands of dollars, or it may be only a few dollars; but in either case the justice of the claim should receive first consideration. The honesty of the firm will be judged by the attitude of the salesman and there should be no hint at any time of any tricks or shady transactions which would reflect on the integrity of both salesman and firm. The straightforward plain business policy must always be followed and when this is done the results will be convincing.

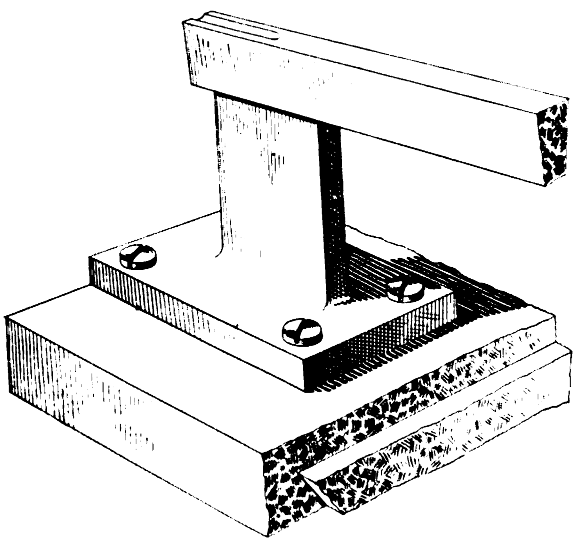
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Cutting-Off Tools That Do Not Chatter

By F. M. A'Hearn

The sketch shows an arrangement of cutting-off tool and support that is used in many shops building heavy machinery, and will cut off work of large diameter without noticeable chatter. The writer has seen it used upon a lathe for cutting off rolls 24 in. in diameter.



CUTTING-OFF TOOL AND SUPPORT

The tool used is of ½ by 2 in. beveled section, slightly wider at the cutting end and concaved on the top surface to narrow the chip. The steady cutting of a parting tool with the cutting edge extending 12 in. or more from the toolpost clamps and going through the entire diameter of the work at one setting without the usually attendant chatter, was remarkable. The chips passed back over the tool without displaying any tendency to wad or pack in the cut.

The height of the tool in relation to the center of the work, which affects conditions when cutting off work of small diameter where the tool is fed in to the center of the piece, does not seem to make so much difference on larger work as does the shape of the tool. The same applies to turning tools. The writer has observed that lathe men in turning work from 2 to 6 ft. in diameter rarely pay much attention to the height of the point of the tool, but they usually take care to keep the clearance as small as possible.

Some Repair Shop Uses for Babbitt

By H. Beard

Having to repair a large bevel gear from which several teeth had been broken out, we built up the teeth by adding metal with the acetylene torch. We then built a mold around six consecutive teeth that were in good shape and poured it full of babbitt. Before the cast was entirely cooled we pounded it on the back to make certain that it fitted the teeth and then, removing it, we had a templet to which the new teeth were fitted by chipping and filing.

At another time we had occasion to grind the bore in a number of manganese pinions. We took a pipe flange into which we screwed a short nipple of an internal diameter somewhat larger than the outside diameter of the pinions, slipped it over the tail spindle of a lathe, set one of the pinions against the faceplate and indicated it true; brought up the flange and nipple and secured it to the faceplate, stopped up all the openings except a pour hole and filled the annular space thus formed full of babbitt. This gave us a chuck into which the pinions could be slipped successively and ground, with the assurance that they would run true.

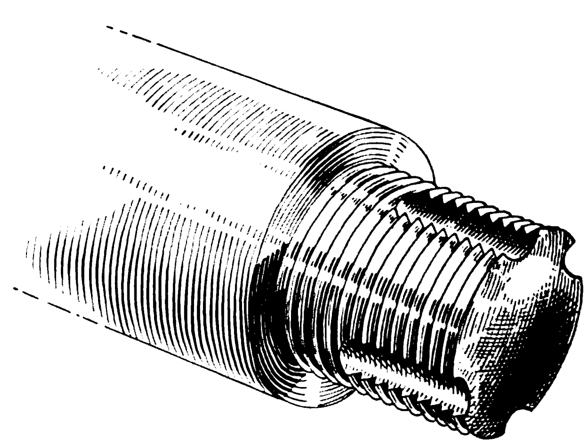
We also had trouble with a gear that persisted in slipping endwise upon its shaft and we could not afford to shut down long enough to take down the shaft and refit the key. There was a solid bearing with a smooth face several inches away from the gear hub and into this space we laid several rods, cut to the proper length to fill the space, and bound them in with twine. Wrapping a piece of sheet iron around the whole and stopping up the small openings with clay, we had a mold that we filled with babbitt. When the mold was removed there was a babbitt thrust collar between the gear hub and bearing with no dangerous screws or bolts protruding.

Fluting Screw Studs to Clean Out the Dirt

By Charles Mathias

When using screw studs for cleaning internally threaded parts, I find it desirable to cut one or more flutes in the end, as shown in the sketch, for the purpose of removing the small particles that are liable to lodge in the threads after tapping.

The flutes can readily be cut with a small radius



FLUTING THE ENDS OF SCREWS

cutter and need extend only to the length of three or four turns of thread. They do not weaken the stud to any extent because they are cut only to a depth that is just below the root diameter.

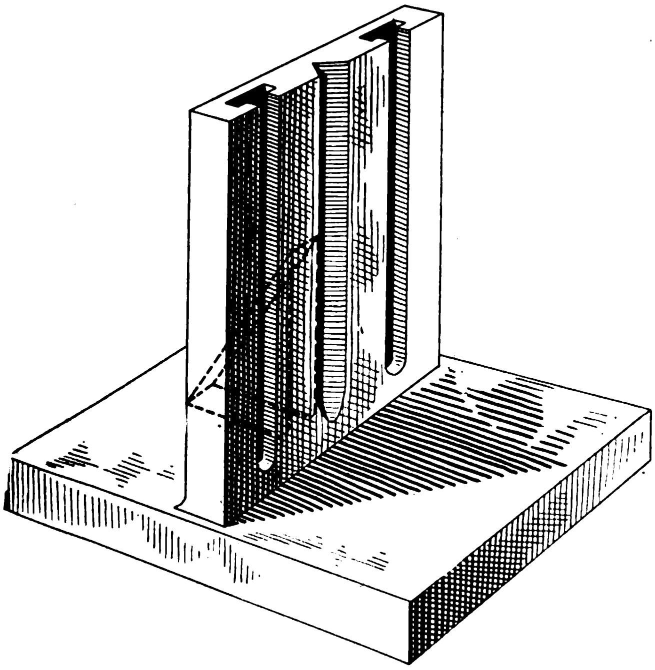
The same scheme can be used to advantage upon screws that are to be used as clamp screws on drilling or milling jigs, fixtures, and the like, and will save a deal of trouble caused by the holes becoming clogged.

Toolmaker's T, or Set-up Block

By J. A. Raught

The accompanying sketch shows a toolmaker's T, or set-up block, of the kind that the toolmaker finds very useful in laying out or setting up work that must be measured or machined at a definite distance from some fixed surface, as a bench plate or the table of a machine.

Instead of being drilled full of holes, as is usually the case, the T-slots are provided so that work may readily be clamped anywhere on its surface. The



TOOLMAKER'S SETTING BLOCK

vertical V-groove in the face facilitates the setting up of pieces having round shanks or parts. The extension base gives the tool a good firm bearing upon whatever surface it may be resting and it is not, therefore easily knocked over, to the detriment of the work clamped upon it.

Hardening Sense

By R. McHenry

There is no mystery or magic about the proper hardening of tool steel. A knowledge of the material and method is of course essential, but when warped or cracked work results, it is not without some definite reason, however hidden. The frequent howl concerning spoiled work is—"it was in the steel." I also believe this to be the correct reason in a majority of cases, but it does not necessarily place any blame on the steel maker. For "it" was probably not in the steel when he shipped it. "It" was put in during the machining operations of that particular piece of work. The "it" in this case applies to the change of structure, or strains set up, incidental to the removal of surplus stock. Normalizing or simple annealing will return the stock to a state of repose. Annealing after heavy machine work, hammering, etc., is not a new scheme, it has been recommended by steel manufacturers for years. But many at the hardening tank steadily disregard it to their own detriment.

I have found that a habit of relieving the tension on *all* tool steel to be hardened, pays and pays well. The normalizing process need not be carried out as thoroughly as in the annealing of hardened work. Heating barely to a low red and allowing the piece to cool fairly slowly until it can be handled is usually satisfactory.

The better brands of steel are pretty reliable these days, but many times they are unjustly knocked.

The hardening operation must be done just as intelligently as the designing and machine work. No die ever cracked or warped without some cause somewhere and this can usually be overcome if the right system is followed.

Here are a few "Don'ts" in regard to the hardening end which many of us know but do not pay sufficient attention to: Don't rush the heating. In annealing, hardening or tempering, heat thoroughly and evenly all over. It is a well-known fact that the heating of alloy steel quickly will prevent it from hardening properly; slow heating is not detrimental to carbon steel either.

Don't overheat: The metal will not be so hard and fine grained if quenched when above its critical point. If overheated slightly put aside until cool; then reheat correctly. If greatly overheated (burnt), scrap it at once.

Don't allow the steel to soak after it has reached a red heat; the soaking should be done first, not last.

Don't quench at a falling temperature. Dipping should be done immediately the correct rising heat is obtained.

Don't harden all sort of tools exactly the same. Take into account the shape, location of sharp corners, steam pockets (which perhaps should be packed with fireclay) and thin sections. When frail pieces are to be water-hardened, a film of oil on the bath or the use of warm water, greatly lessens the danger of springing and cracking.

Don't use dirty water or dip many pieces in a small stagnant bath, expecting the last piece to be hardened like the first. The tank should be of sufficient capacity to maintain a fairly even temperature, or else have fresh liquid running in.

Don't throw work into the bath and trust to luck. Usually the heavier portions of the piece should be chilled first. Work must not lie on the bottom of the tank, but must be held near the center and continually agitated, if fresh water is not coming in.

Don't put heavy cold tongs on light pieces before dipping. The tongs will take away the heat quickly at point of contact.

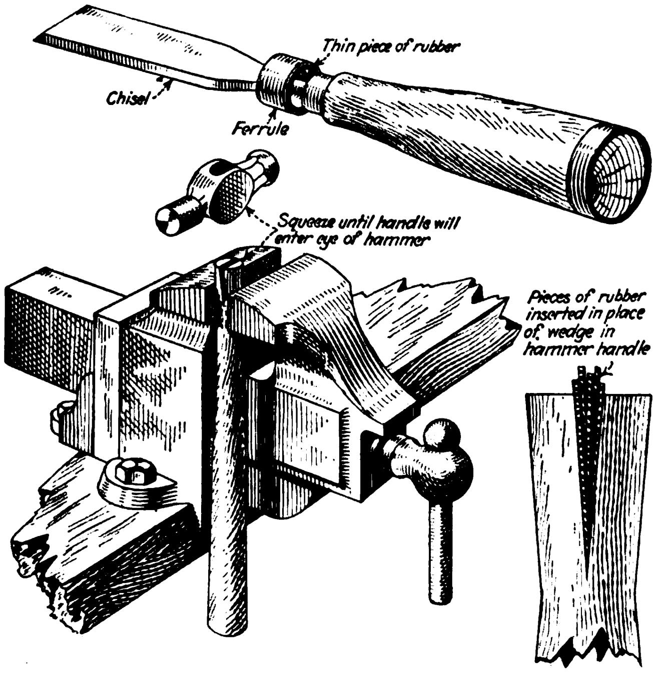
Don't leave a large die or tool in bath until the outside is cold; then toss it on the bench and be surprised if it should fly in pieces. The center may still be quite hot and exerting enormous pressure. It is a good plan to reheat the outside slightly, immediately after quenching. Many quench first in water and then in oil. I believe the less strains put in tool steel before heat-treating the better, and that normalizing does much to favor both steel and hardener.

Rubber "Wedges" to Hold Handles in Hammers

By G. L. Henderson

After experiencing considerable annoyance from having the ferrules of my chisels, gages, etc., come loose, I tried packing under them with stiff paper, but found that little relief was obtained with this means.

One day, spying an old tube from an automobile tire lying upon the floor, I cut off a piece of the thin



A NEW USE FOR INNER TUBES

rubber and, wrapping it around the shoulder portion of the chisel handle, drove the ferrule over it. Since discovering this effective remedy I have not been bothered with loose ferrules.

As it worked so well in this instance I devised another application of the same method. In putting a new handle in a hammer head I first inserted several thicknesses of the rubber in the notch where the wedge is supposed to go; then squeezing the handle in a vise with about half an inch protruding I drove the hammer head over it. The rubber expands the split end of the handle and prevents the head coming off.

Brake Device Applied to a Running-Balance Machine

By Charles Kotersall

The accompanying drawings show a device used for braking or stopping a flywheel or object that is being balanced. The device was attached to a Defiance running balance machine, without changing or effecting the machine proper to any great extent.

Most manufacturers have no way to stop or brake the object that is being balanced on a running balance machine, and without braking, a flywheel or other object being balanced will sometimes run as long as fifteen minutes before coming to a dead stop. This, of course, is a lot of time wasted. With the device shown in Fig. 1 the flywheel or object to be balanced can be brought to a dead stop in less than fifteen seconds.

The only necessary changes made on the machine were on the driving disk *A*, which was turned to a diameter to accommodate the housing *B*, and the upper bearing flange *C*, which was milled off to get a square bearing surface for the housing *B* where the bolting surface rests at *D*.

The center flange *E* is bolted to the flywheel by bolts and nuts *F* with the two driven collars *G*. The female center plug *H* is hardened and ground and fits snugly into the center flange *E*. The adjusting screw *I* butts against the female center plug *H*. As the plug *H* and the male center *K* wear to an uneven or irregular surface they should be re-ground and lapped to a smooth finish. The screw *I* also adjusts for the space between the thermoid ring and work. Both centers *H* and *K* should be hard.

Before the operator places the work on the machine he must have the fingers *L* and *M* set upright, as shown in Fig. 2. The work is then placed on the male and female centers *K* and *H*. The operator must see to it that in placing the work he does not disturb or knock down the fingers *L* and *M*. The operator then brings the work against the driving fingers *L* and *M* which drive against the collars *G* thus putting the work into motion. The finger-supports *M* and *O* hold the fingers *L* and *M* which are pivoted on the pin *P*. After the work is at the proper speed, the fingers *L* and *M* will automatically kick off or release themselves by falling to the position as shown in Fig. 2.

While the flywheel is in motion the operator is chalking the wheel to get the high point or the out of balance part of the wheel. After this is done it is required to stop the flywheel. The stationary cam *Q* slides in an upward and downward movement on the four keys *U* which are seated and held in place by means of fillister head screws. The brake lining attached to the cam *Q* is thermoid and must be attached very rigidly by means of

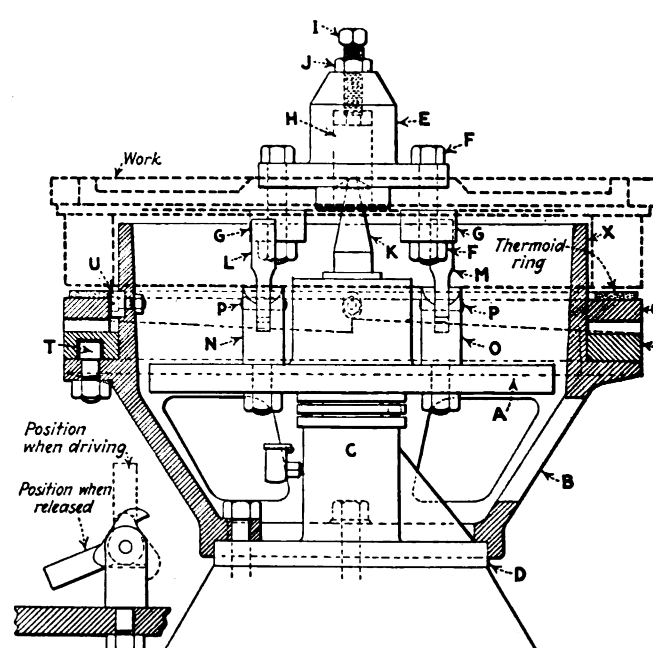


FIG. 2

FIG. 1

FIG. 1. BRAKING DEVICE ON THE MACHINE. FIG. 2 DRIVING AND RELEASED POSITIONS OF FINGERS

copper rivets. The lower cam *R* is operated by means of a lever in the direction in which the machine revolves, thus advancing the cam *Q*, with the thermoid

lining, upward against the flywheel rim and braking the momentum of the work, and also lifting the female center *H* off the machine center and thus bringing the work to a standstill. The housing *B* has a rim projecting up into the work at *X* acting as a pilot to prevent the work from sliding off when in motion or braking the momentum. The stop pin *T* is fastened to the housing frame *B* to prevent the cam *R* from passing beyond the four high points of the cam *Q*.

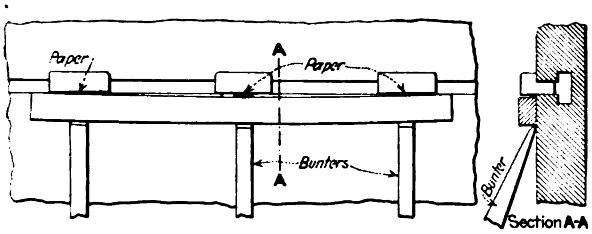
It is also understood that all revolving parts are to be perfectly balanced.

Planing Gibs Flat

By John E. Hoaglund

On page 219 of American Machinist, Tell Berna describes a way of planing gibs flat that I think is deserving of comment.

When I first learned the rudiments of planing I had as a teacher an old foreman who had spent most of his



METHOD OF CLAMPING TO PLANE WORK FLAT

life in working upon planers. The first thing he told me was: "Clamp and support your work right and you will not have to do much straightening. Avoid having to straighten the work as much as possible, for it is very difficult to straighten a piece correctly, and even if you succeed in getting it straight it probably will not remain so."

Almost any piece, especially if it is long and narrow, will not only bend but it will twist as well, so that opposite corners will be "high." On the second setting when the planed surface is in contact with the planer bed these corners, and perhaps also the middle of the piece, must be supported by packing with paper or other suitable material so that when the pressure of the clamps is applied the work will not be sprung or distorted.

Old time cards or cigarette papers make excellent packing material. Incidentally, this is the best use I have yet discovered for cigarette papers, as they are uniform and measure only about 0.001 in. in thickness.

Assuming that one of the wide sides of the gib has been planed and that it has been turned over to plane the opposite side: If now the narrow side is not straight and square (and it can not very well be so, as it has yet to be planed), it will be necessary to pack between it and the surface against which it bears, else the pressure of the clamps will distort the work not only in a sidewise direction but the under face as well, and it will be impossible to get a straight job.

My way of doing this job would be to paper up the under surface first and test it by rapping with a wrench or hammer to determine when it is properly supported, then to pack between the work and the abutting surface against which it is held at points opposite to each bunter, as shown in the cut. The bunters should be narrowed to a thickness of about $\frac{1}{16}$ in. at the end and slightly rounded.

A roughing cut should be taken over both wide sides, packing up the piece as described for each cut, and then the two narrow sides should be roughed with one of the wide planed surfaces bearing against the abutting pieces; assuming, of course, that these latter are square with the planer bed.

The same sequence of operation should then be repeated for the finishing cuts, using extreme care to see that all "high points" are properly supported in each direction before applying the pressure. To the experienced planer operator. an improperly supported place in the work is instantly detected by the sound of the piece when struck lightly with the hammer.

Clamping pressure should be applied very lightly upon the finishing cuts.

Tube End Closing Tools

By S. A. McDonald

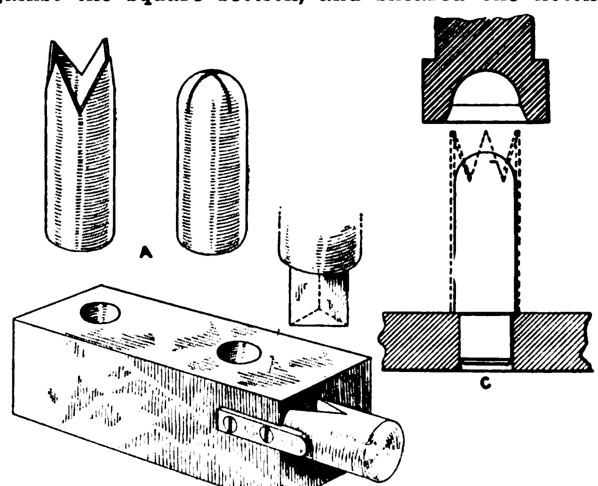
A small jobbing shop got an order to manufacture 10,000 pieces, as shown at *A* in the accompanying illustration, and made a profit because of the low tool cost.

The stock used was $\frac{3}{4}$-in. tubing with a $\frac{1}{32}$-in. wall, cut off to $2\frac{1}{4}$ in. long by a $\frac{1}{16}$-in. abrasive wheel. This left the ends with a good finish. The notching die was made from a bar of $1\frac{1}{2}$-in. tool steel planed on two sides and one end turned to fit the inside of the tube, as shown at *B*.

Before the die opening was made in the turned end of the bar, it was necessary to make the closing die to determine the shape of notch that would close perfectly. This was done by filing a tube experimentally and trying it in the closing die *C*.

The shape of the notch having been settled the opening in the die was made to correspond. A locating gage was made and secured to the side of the die, and the bolt holes drilled to secure the die to the bolster. The punch was made from a piece of tool steel, turned and milled to fit the die.

The first operation was as follows: The locating gage being removed the operator held the tube on the die against the square section, and sheared one notch in



TOOLS FOR CLOSING ENDS OF TUBES

each tube. The locating gage was then put on and the other notches cut. In the second operation the tube was placed over the plug and when the punch came down it curled the prongs in and hit the stock hard enough to spread it slightly so that the end of the tube was nearly water tight.

EDITORIALS

The Truth About the Coal Strike

THE domestic consumer of coal has evinced complete indifference to the big strike which is now three weeks old. He has little love for the coal operator whom he strongly suspects of profiteering and less sympathy for the union miners who are endeavoring to maintain their more than war-time wage rates while nearly every one else has had to accept more or less stiff reductions.

The manufacturer, on the other hand, who is apt to look farther ahead, is beginning to be somewhat apprehensive of the effect of a protracted strike on our slowly recovering business. He is interested in the merits of the case as having some bearing on the final decision and as offering some indication of the duration of the struggle.

But what are the merits of the case? In the bituminous coal industry, which should not be confused with the anthracite industry because there is no connection between them, the operators of the unionized mines, producing about two-thirds of the bituminous coal mined, are determined to force a reduction in wages sufficient to allow them to compete with the operators of non-union mines. The miners are equally determined to hold on to the gains they have made. They are entirely willing to enter an interstate conference because a national agreement is what they want as a step toward nationalization of the industry. They have made a lot of capital and gained a certain amount of undiscriminating sympathy from the daily press and in Congress by their claim that the operators have broken their contract by refusing to enter the conference which the miners were willing to take part in.

The operators on their side, claim that the miners broke their contract five months after it was signed and that the operators are no longer subject to its terms. There is little profit in the argument which is based on technicalities. However, the operators have another point to consider; more than a hundred of them are under indictment for conspiracy under the Sherman law for signing the agreement which has just expired. The operators have also offered repeatedly to meet their men in separate state wage conferences.

The operators also object to a continuation of the "check-off," a practice originally useful which has degenerated into an abuse. By it the mine unions force the operators to hold back the union dues of the miners and pay them to the union treasury, thus contributing material assistance to an organization which is fighting them in every way, even to the extent of using funds so collected in attempts to organize non-union fields.

Much has been said and done before and during the early stages of the strike to confuse the issue. The immediate problem is to deflate the coal industry to a degree somewhat commensurate with the deflation of other industries. The greater problem is to place the industry on an economic basis. On the production side there are too many high cost mines and too many miners. On the distribution side there is too great a spread between the price at the mine and the cost to the consumer. The distribution problem, of course, has nothing to do with the strike, but it must be settled before the coal situation can be called satisfactory.

In the meantime the consumer pays the bill and will be the greatest sufferer if the strike lasts very long.

Businesses Which Do Not Survive

BUSINESS depressions like the one we are now fortunately beginning to leave behind are not the only causes of business decadence. Perhaps the most deplorable cause of all is what is commonly called "dry rot"—the failure to keep abreast of the times either in machine equipment, in methods or in the handling of employees.

There are many concerns in the country which date back to the early days of centralized industry, when the relations between employer and employee closely resembled feudalism. Paternalism, the considering of employees as "my people," is still with us in too many instances.

Concerns which want to survive, which desire to keep their place in their respective industries, will do well to study carefully the question of personnel, of harmonious relations with their employees, not only today, but in the future. Those who are carefully studying industry as a whole see unmistakable signs of decay in some of the largest concerns. This frequently comes in cases of one-man management where the one man, with the greatest sincerity, believes that it is his duty to act *for* his men, instead of *with* them.

We have in mind one well-known concern of excellent repute, outside the machine industry, to which this applies. There is no question as to the honesty or sincerity of the man who directs its destiny. He is a hard working, courageous manager who honestly believes that he is ordained to act and to think for his men—that they should be perfectly willing to have him the sole arbiter of their destinies. No one else has any real authority and he refuses to see that the industrial world has advanced beyond the feudal period.

Young and ambitious men with a capacity for management in the modern way find no opportunity with him and drift away to other careers. The young blood which all concerns need, is either forced out or is congealed by repression until it is as reactionary as those in command.

We have had numerous examples of large concerns, once leaders in their line, gradually dropping by the wayside and becoming only a memory. It is perhaps the greatest danger facing a large and powerful organization. Power, backed by years of success, forgets that it became powerful by striking out with new methods, and instead, hugs the delusion that no changes are necessary.

Consideration shown where it could easily be dispensed with helps to build up confidence worth much in busy times, and may well turn the balance from failure to success.

Shop Equipment News

Rearwin Nos. 3 and 4 Enclosed Die-Filing Machines

W. D. Rearwin, 716 Monroe Ave., Grand Rapids, Mich., has recently placed on the market Nos. 3 and 4 sizes of his die-filing machine, the operating mechanism of which is enclosed in a metal case. The machine is similar in principle, although smaller in size, to the No. 6 machine described on page 246, Vol. 54, of AMERICAN MACHINIST. It can be mounted on a bench or on a short column equipped with disappearing casters, the latter mounting being shown in the accompanying illustration.

The No. 4 machine is provided with a 12-in. square table arranged to tilt to all four sides, and having the swiveling mechanism graduated to 7 deg. on each side. An adjustable hold-down clamp for the work moves with the table. The position of the slide carrying the file is adjustable; also the length of stroke is adjustable from nothing up to 3 in. Speeds of 200, 300 and 400 r.p.m. are provided.

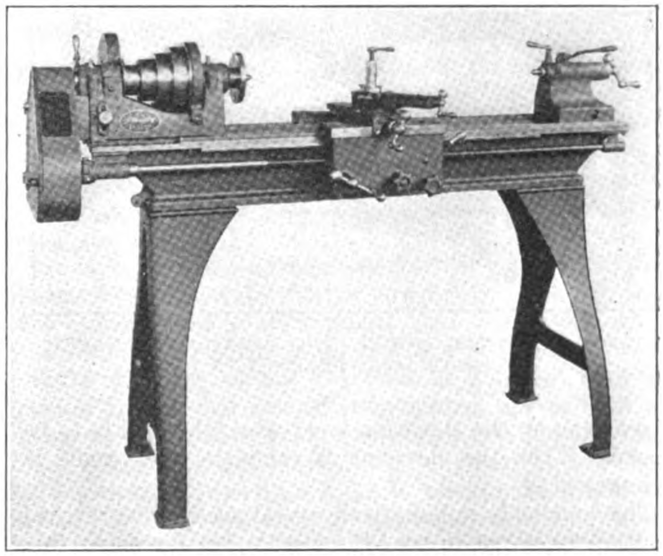
REARWIN DIE-FILING MACHINE

Both special and standard files can be used, as the upper arm has a wide range of adjustment in all directions and the machine holds securely different shapes of files. The weight of the machine separate from the motor and column does not exceed 60 lb. The No. 3 machine is the same as the No. 4 except that it is smaller, and has a 1½-in. stroke and an 8-in. square table.

Seneca Falls "Handy" Lathes

The Seneca Falls Manufacturing Co., Inc., Seneca Falls, N. Y., has recently placed on the market a screw-cutting engine lathe ranging in size from 9- to 13-in. swing and having the usual bed lengths. This machine, shown in the accompanying illustration, is known as the "Handy" lathe. It is a general-purpose machine, designed especially for the radio industry, and for starter and magneto service stations. It can be arranged for either motor or belt drive, and all the regular "Star" lathe attachments may be used in connection with it.

The bed is of heavy ribbed construction and equipped with either bench or floor legs. The headstock has back gears and a large hollow spindle adapted to draw-in chucks. Power longitudinal and cross feeds, graduated crossfeed screw, and a set-over tailstock are provided.



SENECA FALLS "HANDY" SCREW-CUTTING LATHE

A plain or compound rest, and a double friction countershaft having a cone belt shifter and self-oiling bearings can be furnished.

This company is also placing on the market a plain turning lathe having a 10½-in. swing and 3-ft. bed, and taking 12 in. between centers. The machine is equipped with a plain rest, feeds from 0.002 to 0.040 in. per revolution of the spindle, set-over tailstock, three-step cone and self-oiling spindle. The countershaft is of the tight-and-loose pulley type with roller bearings in the loose pulley. This machine is intended for plain turning where screw-cutting is not necessary, and it is especially adapted to use in the making of small parts for electrical apparatus.

Plimpton Industrial Hand Trucks

The Plimpton Truck Co., Elm Court, Stamford, Conn., has recently placed on the market the Model-E elevating transfer truck shown in Fig. 1. The construction of the truck itself can be seen in the lowest view, while a wooden platform in position on the truck is shown in the central view. The front end plate of the truck is a combined step and thrust bracket, against which the operator may press the handle to force the truck backward. Due to the radius on the end plate, the wheels can be swung while the handle is pressed against the plate. The stop for the platform extends across the entire width of the truck, so that wear on the ends of the wooden platforms is not excessive.

The loaded platforms are released by pressing the pedal only. It is not necessary to bring up the handle in order to start the action of the cams. The hook and link mechanism consists of a single connecting link pivoted on a cam section, which is depressed over an

FIG. 1. PLIMPTON MODEL E ELEVATING TRANSFER TRUCK AND PLATFORMS

offset hook on the elevating lever when the load is to be raised. When the elevation is complete, the handle is disengaged.

The handle is automatically retained in the vertical position when not in use; the mechanism for doing this is a spring-loaded plunger operating in a tongue on the heel of the lever. The truck is made in capacities of 3,000 and 4,000 lb., with platform sizes of 7 x 18 x 36 to 7 x 18 x 52 in. for the former and 7 x 20 x 36 to 9 x 20 x 52 in. for the latter.

The platform can be made of wood, with four metal feet secured by means of screws. Detachable steel platforms, such as shown at the top of the illustration, can be employed. The top plate of the steel platforms may be from $\frac{3}{16}$ to $\frac{3}{8}$ in. in thickness. The side channels may be employed in the size and weight necessary for the work. The feet are of steel and bolted in place. The channels are spaced so as to allow 2 in. side clearance for the truck. The platform may be easily dismounted. It can be furnished for any truck length in standard widths of 24, 30, 36, 42 and 48 inches.

The truck shown in Fig. 2 is a heavy-duty, non-elevating platform style for use especially in foundries and machine shops where heavy, compact loads are handled. The truck has a wide wheel base and steering knuckles of the automobile type, so that it is practically impossible to upset the truck by too heavy loading on one side.

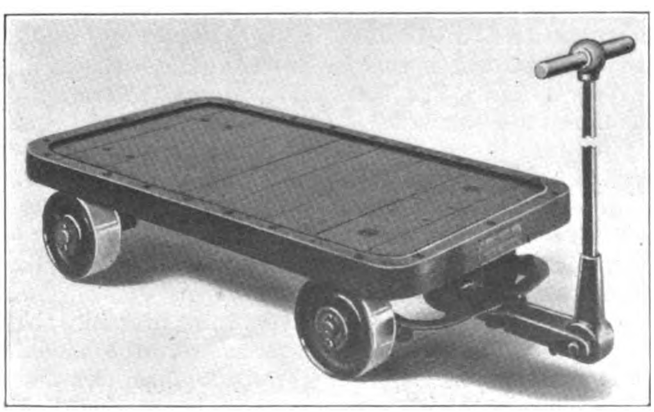


FIG. 2. PLIMPTON HEAVY-DUTY PLATFORM TRUCK

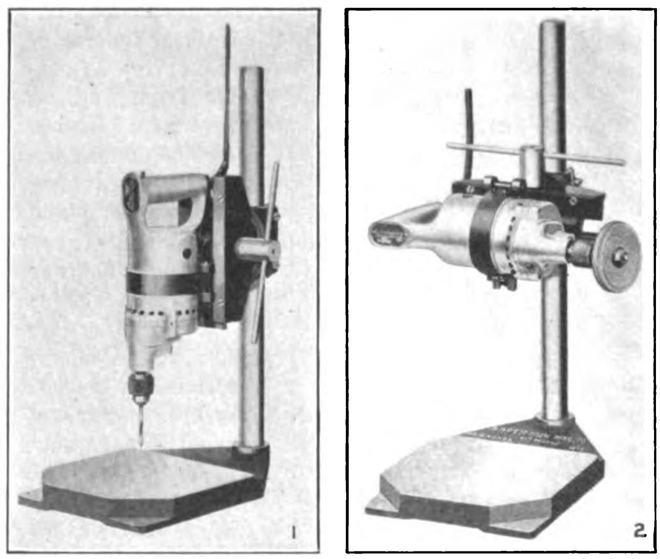
The wheels can be provided with either ball or roller bearings. The top is made of heavy oak planks and bound by angle iron at the edge, the corners being rounded. The handle is normally held in a vertical position by a spring-loaded plunger. The truck may be furnished to steer on either two or four wheels.

The truck is made with load capacities of 2,000, 3,500 and 5,000 lb. In the smallest size, platforms 18 in. wide and from 36 to 52 in. in length are provided, with a height of 8 in. In the medium size, the truck can be furnished in heights of either 8 or 10 in.; the platform is 20 in. wide and varies from 36 to 52 in. in length. In the largest size, the platform is 24 in. wide and varies from 44 to 72 in. in length. The height is 10 in. The net weights range from 161 to 352 pounds.

Both styles of trucks just described can be equipped with wide flanged wheels, so that they can be used either on rails or directly on the pavement or ground of the yard or building. In this way, the flexibility is increased, as the trucks are adapted to both indoor and outdoor work.

Petersen "Hole Shooter" Portable Drill Stand

The A. H. Petersen Manufacturing Co., Milwaukee, Wis., has recently placed on the market a portable drill stand for use with the "Hole Shooter" electric drill.



FIGS. 1 AND 2. "HOLE SHOOTER" PORTABLE DRILL STAND

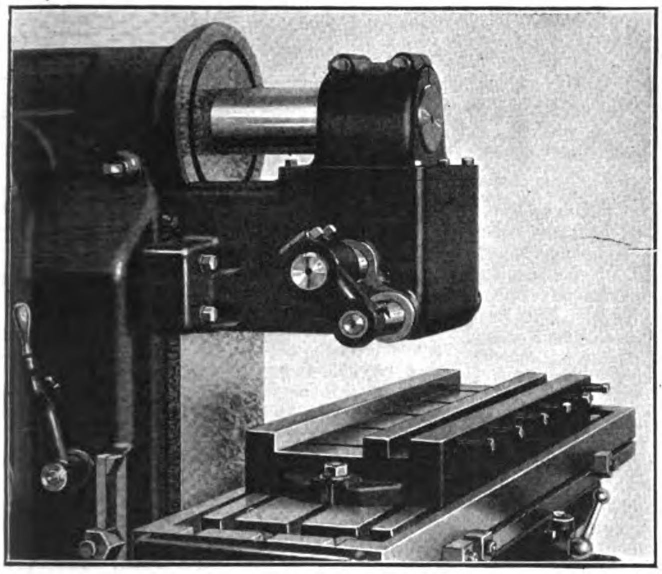
With the drill vertical, as shown in Fig. 1, the combination serves as a bench drill. With the motor swung to the horizontal position, Fig. 2, the device can be used as an electric grinding machine, or for buffing or polishing. Many other applications are possible, due to the fact that the spindle of the machine can be set to operate at any angle. The adjustment is easily made after loosening the setscrews.

The base of the stand is of cast iron, with a finished table 8 x 8 in. The upright is of 1¼-in. cold-rolled steel. The range of travel of the slide is 12 in., and the range of travel of the rack in any one position is 3½ in. The weight of the stand is 30 pounds.

The design and construction of the stand permits the elimination of springs for controlling the rack travel.

Rockford Rack-Cutting Attachment

The Rockford Milling Machine Co., Rockford, Ill., has recently developed the rack-cutting attachment shown in the accompanying illustration for use on its milling machine. The attachment is intended primarily for the purpose of milling racks, but is not limited to this work alone. It is simple in design and rigid in construction. It clamps to the face of the column of the machine, and is further supported by means of the overhanging arm



ROCKFORD RACK-CUTTING ATTACHMENT

above the spindle. The method of clamping provides rigidity, even when taking the heaviest cuts within the capacity of the machine. The attachment is intended especially for use on the heavy-duty milling machine, but can also be furnished to fit the No. 1½ machine.

The attachment is driven from the main spindle of the machine through wide-face, hardened spur gears, driving the pinion keyed to the double-lead worm. The worm is of alloy steel, and provided with ball thrust bearings. A heavy bronze wormwheel of coarse pitch has keyed to it two wide-face spur gears with staggered teeth, providing a smooth drive. Spur gears are cut directly on the spindle, one very close to the front and the other to the rear bearing.

The spindle is of alloy steel and runs in tapered bronze bearings. A single nut provides means of taking up wear on these bearings. A solid shaft runs through the entire drive mechanism and carries a bearing at each end, so as to serve as an overarm support for the cutter arbor. The worm and all gears run in a bath of oil.

A rack indexing attachment and rack vise can also be furnished. The rack-indexing attachment is fastened to the T-slot at the left-hand end of the table, and consists of a bracket which carries an indexing and locking disk with change gears. It provides for cutting racks and making settings without relying on the dials of the milling machine.

The various gear combinations permit racks of different pitches to be indexed, by making either one-half turn, one complete, or two complete turns of the locking disk. Eighteen change gears provide for cutting diametral pitches from 3 to 6 by half pitches, all pitches from 7 to 16 and all even pitches from 18 to 32; also circular pitches from $\frac{1}{16}$ to 1 in., varying by $\frac{1}{16}$ in. The rack vise has jaws 36 in. long and will open 5⅜ inches.

Atlantic Simplex Safety Stop

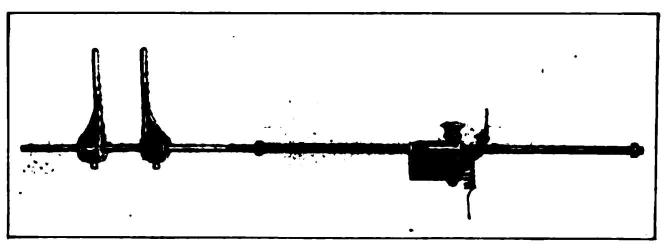
The Atlantic Co., 452 Classon Ave., Brooklyn, N. Y., has recently placed on the market the Simplex safety stop shown in the accompanying illustration. The device is intended for attachment to automatic machines of many types, so as to stop them in case of irregularity or breakage of the work, or change in tension size, speed or some other condition of operation.

The device is operated by current from either a battery, a generator, or the regular lighting circuit. It is wired in series with a Mazda lamp, which remains unlighted normally because the circuit is open. The circuit is closed when the shifter is caused to operate by the irregularity in the work. However, a circuit breaker instantly opens the circuit, so that only a surge of current is necessary. The contact points are thus left without current when the stop has acted, so that there is no danger of the operator coming in contact with the live leads.

A latch in the stop holds a notched shifter rod that keeps the belt in the running position. Wires run from the stops to the contact points that are placed where the trouble may occur in the machine or work. If these points close the circuit the latch is released, and the spring in the rod immediately moves the belt to the loose pulley or disengages the clutch. When the magnets in the stop are energized by current, an armature is drawn out of position so as to release the levers and latch. A hand stop entirely independent of the electrical connection is provided.

The stop can be furnished for either 6 or 110-volt current, either a.c. or d.c. It is made for ½, ⅝ or ¾ in. shifter rods. A spring providing any force up to 75 lb. can be utilized, so that it is possible to shift a 6-in. belt. The stop itself is 3¼ x 2⅝ x 2⅛ in. in size.

The stop may be mounted on the machine in many different ways, and different forms of contact points can be employed. It may be set to give the same effect as the action of a treadle or hand lever. The size of machined work may be controlled to within 0.001 in. by



ATLANTIC "SIMPLEX" SAFETY MACHINE STOP

using the needle of a lathe indicator to complete the electrical circuit. Breaking or knotting in threads or wires being fed continuously can be caused to operate the stop.

Machinist Retires at 102

When Andrew Rafferty, for many years employed as a machinist for the Baltimore & Ohio Railroad at its Washington, Ind., shops, retired a short time ago, there was much discussion as to how old he was. He would give no information on the subject himself so his friends started an investigation which resulted in the discovery that he was 102 years old. He received his naturalization papers in 1864 when he was forty-five years old.

Senate Committee Approves House Tariff Rate on Machinery

A tariff duty of 35 per cent ad valorem for machine tools and parts of machine tools, which had been prescribed by the House of Representatives, was approved by the Senate Finance Committee in the bill reported on April 11. Steam engines and locomotives were given a rate of 20 per cent ad valorem by the Senate committee, an increase of 5 per cent over the rate prescribed by the House. The Senate added to the machinery paragraph, the following:

"Sewing machines, and parts thereof, not specially provided for, valued at not more than $75 each, 25 per cent ad valorem; valued at more than $75 each, 40 per cent ad valorem.

"Cash registers, and parts thereof, 25 per cent ad valorem.

"Printing presses, not specially provided for, 35 per cent ad valorem.

"Lawn mowers, 35 per cent ad valorem.

"Knitting, braiding and insulating machinery, and all other textile machinery, and parts thereof, finished or unfinished, not specially provided for, 50 per cent ad valorem."

Embroidery and lace-making machines, as well as machines for making lace curtains, nets and nettings, are given a 30 per cent ad valorem rate by the Senate. The same rate is applied to all other machines not specially provided for. In this latter case it is a reduction of 5 per cent from the rate contained in the House bill.

The machine tool item is subject to the usual proviso to the effect that "machine tools means any machine operated other than by hand power, which employs a tool for work on metal."

The bill provides that in addition to the duties ranging from one cent per pound to three and one-half cents per pound on steel suitable for toolmaking, an additional duty of 10 per cent ad valorem shall be provided when the steel contains more than six-tenths of 1 per cent of nickel, cobalt, vanadium, chromium, tungsten, molybdenum, or any other metallic element used in alloying steel. An additional cumulative duty of 72 cents per pound is levied on the tungsten content in excess of six-tenths of 1 per cent. A cumulative duty of $1.25 per pound is levied in addition on the molybdenum content of steel in excess of six-tenths of 1 per cent.

Anti-friction balls and rollers, metal balls and rollers used in ball or roller bearings, as well as the bearings themselves, whether finished or unfinished, are given a duty of 10 cents per pound and 55 per cent ad valorem. The Senate raised the ad valorem portion of the rate from 35 to 55 per cent.

Among the articles on the free list are the following:

Agricultural implements: Plows, tooth or disk harrows, headers, harvesters, reapers, agricultural drills and planters, cultivators, thrashing machines, cotton gins, machinery for use in the manufacture of sugar, wagons and carts, centrifugal cream separators operable by hand power, and all other agricultural implements of any kind or description, not specially provided for, whether in whole or in parts.

Temporary Receivership for Rivett Lathe and Grinder Company

As a result of the general business depression the affairs of the Rivett Lathe and Grinder Company have been placed in the hands of a receiver. The court has authorized the receiver to continue production without a break. The sale of receiver's certificates has provided ample funds for operation and the factory is now running on an increased schedule with the original personnel. The company is ready to receive and fill orders as usual and expects that a reorganization will soon terminate the receivership as assets are conservatively estimated to be three times liabilities.

Automotive Exports Gain

Total exports of automotive products from the United States during February gained 23 per cent over January, according to figures compiled by the automotive division of the Department of Commerce. A decrease of 2 per cent in number and 15 per cent in value of motor truck shipments was more than offset by an increase of 38 per cent in the value of motor vehicle parts exported as well as a gain of 29 and 26 per cent respectively in the number and value of passenger car shipments. Passenger cars valued below $800 and over $2,000 and motor trucks up to one ton and above 2½ tons capacity made the best showing. Shipments of electric cars and trucks decreased nearly two-thirds.

Courts Decide Government Suits Over War Contracts

The Bethlehem Steel Co. has been awarded $67,000 from the government for royalties on its patents on machinery which were used by the Government at the Watervliet Arsenal. This is a result of a decision of the U. S. Supreme Court in affirming the decision of the Court of Claims, holding that the steel company was entitled to this recovery. The Government appealed the case to the Supreme Court, but on April 10 Justice McKenna, for the court, sustained the Court of Claims in its award to the steel company.

The Court of Claims has dismissed the petition of the Poole Engineering and Machine Co., Baltimore, Md., against the Government for the recovery of $225,000 for excess labor and overhead costs on account of government gun carriage contracts. The suit was based on the claim that the Ordnance Department delayed deliveries of material for the work and also made numerous changes in the plans which added to the cost of manufacture.

Senate Grants $10,000 for Standardization of Farm Machinery

The Senate has adopted an amendment to the agricultural appropriation bill appropriating $10,000 for co-operative investigations by the Department of Agriculture and the Bureau of Standards of the Department of Commerce, looking to standardization and simplification of farm implements and machinery and repair parts, with a view to their more economical manufacture and use. Senator France, of Maryland, proposed the amendment, which provides for investigation by the Agricultural Department and urged the necessity for standardization and simplification of farm machinery. Senator Jones, of Washington, pointed out that the Department of Commerce, through its Bureau of Standards, was already engaged in standardization work, and that it could take up farm machinery. Senator Jones proposed a modified amendment for carrying on the work by the two departments, whereupon it was adopted. Senator King, of Utah, opposed extreme standardization on the ground that it will curb inventive genius.

Editors Have Busy Day at Washington

The meeting of the National Conference of Business Paper Editors on April 13 was of particular interest. In a brief meeting in his office, General Dawes told of the work of co-ordinating the activities of the different departments of the Government so as to conserve resources and avoid duplications. With General Dawes as a guide the editors went to the White House and were presented to President Harding, as a body who had co-operated fully and earnestly with the department in its endeavor to dispose of surplus property of the various war activities.

This was followed by a meeting in the Department of Commerce, presided over by James H. Defrees, to discuss the data and experiences which had arisen as a result of the Unemployment Conference. As was pointed out by Mr. Stone, of Rochester, the elimination of seasonal work as a cause of unequal employment, was more a merchandizing than a production problem, E. E. Hunt, secretary of the Unemployment Conference, spoke of the desirability of co-operation and the desire to publish data which would be of real value, rather than a book which looks well on the shelves but is never consulted. Ernest F. DuBrul spoke of the use of data on business cycles, the tendency to consider peak production as normal and the necessity of knowing costs.

Following this was a meeting at which Col. Roosevelt, Assistant Secretary of the Navy and Admiral Coontz spoke. Both pointed out that the reduction of the Navy to 67,000 men, as proposed by the Senate, would bring it below the 5-5-3 ratios. Both contended that personnel was the main thing in the Navy and asked for 96,000 men. Admiral Coontz pointed out that navy officers did much for foreign commerce, an admiral in Constantinople at the present time being the only means of business communication with Turkey. In speaking of the close relation between the Navy and business he said: "War is only commerce carried beyond a certain stage."

The usual dinner meeting with Secretary Hoover ended the program.

Cincinnati Letter

The shops in the Cincinnati territory are running about the same as they were a week ago. A few have added to their working forces. The Wm. Powell Co. is busy installing equipment in its new plant on Colerain Ave. The Cincinnati street railway directors have ordered the traction company to put on more cars to accommodate the workers during the early morning and late evening hours on the line running to the Oakley factory colony. The Newport Rolling Mill and the Andrews Steel Co. report that they are running 100 per cent of their pre-war capacity and that prices have advanced on their products.

The demand for used equipment during the last week has not been as large as in some weeks in the past, but prospects are very good. The manufacturers of radio apparatus are busier than they ever were before, and cannot keep up with the ever increasing demand. The general outlook is that April business will be at least as good as March.

Comparison of Proposed and Existing Tariff Duties

The following figures are taken from a complete list of proposed tariff duties and the present figures of the Underwood Law as published in the *New York Times* of April 12. In this list the unit of taxation, as weight, volume, square or cubic measure, or ad valorem is stated after the name of the article.

	Senate Bill	House Bill	Underwood Law
Pig iron (ton)	$1.25	$1.25	Free
Scrap iron and steel (ton)	$1.00	$1.00	Free
Molybdenum (lb.)	75c.	75c.	Free
Tungsten ore (lb.)	45c.	43c.	Free
Ferromanganese (ton)	$2.50	2.2c. lb.	Free
Manganese metal (%)	20	2.2c. lb.	10
Ferromolybdenum (lb.)	$1+15%	$1+17%	15%
Tungsten compounds (lb.)	60c.+25%	72c.+15%	15%
Tungsten alloys (lb.)	60c.+25%	72c.+15%	15%
Ferrosilicon, 8-30% silicon (lb.)	2c.	2½c.	15%
Ferrosilicon 30-60% silicon (lb.)	2c.	2½c.	15%
Ferrosilicon, 60-80% silicon (lb.)	3c.	3 1-5c.	15%
Ferrosilicon, 88-90% silicon (lb.)	4c.	4c.	15%
Ferrosilicon, over 90% silicon (lb.)	8c.	8c.	15%
Ferrochrome, 8% chrome (lb.)	3½c.	3½c.	15%
Ferrochrome, under 3% chrome (%)	30	30	15
Other steel alloys (%)	30	30	15
Cerium metal (lb.)	$2.00	30%	30%
Cerium alloys (lb.)	$2+25%	30%	15%
Bar iron (lb.)	0.2–1½c.	0.2-1c.	5%
Steel ingots, &c. (lb.)	0.2c.-25%	0.2c.-20%	Free
Steel bars (lb.)	0.2c.-25%	0.2c.-20%	15%
Steel circular saw plate (lb.)	¾c.	¾c.	12%
Boiler plate (lb.)	7-20c.-20%	7-20c.-20%	12%
Sheet iron or steel (lb.)	45-100c.-20%	45-100c.-20%	12%
Coated iron on steel sheets (lb.)	0.2c.	0.2c.	15%
Structural steel (%)	30	25	10
Hoop and band steel (lb.)	25–100c–35%	25–100c.–20%	35%
Coated hoop and band steel (lb.)	¾c.	¾c.	Free
Wire rods (lb.)	0.3-0.6c.	0.3-0.6c.	10%
Steel wire (lb.)	¾c.-40%	¾c.-30%	10–25%
Galvanized wire (lb.)	¼c.	¼c.	15%
Anti-friction balls (lb.)	10c.—55%	10c.—35%	35%
R. R. fish plates (lb.)	¾c.	¾c.	10%
Other R. R. bars (lb.)	7.40c.	7.40c.	Free
Steel axles (lb.)	0.6c.	0.6c.	10%
Steel R. R. wheels (lb.)	1c.	1c.	20%
Seamed steel tubes (lb.)	¾-1½c.	¾-1½c.	20%
Flexible metal tubing (%)	35	25	20
Chains (lb.)	¾c.	¾c.	20%
Machine chains (%)	50	30	25
Nuts and washers, (lb.)	0.6c.	0.6c.	5%
Bolts, (lb.)	1c.	1c.	10%
Spiral nut locks, (%)	40	30	30%
Rivets and studs, (%)	40	25	20
Other steel rivets, (lb.)	1c.	1c.	20%
Iron or steel grit, (lb.)	¾c.	1c.	30%
Jewelers' saws, gross	40c.	40c.	12%
Steel printing plates, (%)	25	15	15
Needles, per M.	$1.15+40%	$1.15+25%	20%
Latch needles, per M	$2+50%	$2+35%	20%
All other needles, (%)	45	30	20
Laboratory instruments (%)	50	40	Free
Nippers and pliers (dozen)	8-12c.+50%	8-12c.+25%	30%
Files (dozen)	25-77½c.	25-77½c.	25%
Swiss pattern files (%)	50	25-27½	25
Watch movements	$1.25–$10.75	$1.25–$10.75	30%
Watch case and parts (%)	50	35	30
Clocks and clock movements	50%	35%	30%
Same with jewels	$1-$3+50%	$1-$3+35%	30%
Clock parts (%)	55	40	30
Automobiles and parts (%)	25	25	30–45
Airplanes and motorboats (%)	30	30	*
Bicycles (%)	45	30	25
Motorcycles (%)	25	30	25
Steam engines and locomotives (%)	20	15	15
Sewing machines under $75 (%)	25	Free	Free
Sewing machines over $75 (%)	40	Free	Free
Cash registers (%)	25	Free	Free
Printing presses (%)	35	35	15
Embroidery machines (%)	30	35	25
Textile machinery (%)	50	35	25
All other machines (%)	30	35	25
Aluminum, crude (lb.)	5c.	5c.	2c.
Aluminum, plates, bars, &c. (lb.)	9c.	9c.	3½c.
Magnesium, metallic (lb.)	50c.	$1	25%
Magnesium, alloys (lb.)	50c.+20%	$1+20%	25%
Antimony metal (lb.)	2c.	1½c.	10%
Bismuth (%)	7½	Free	Free
Cadmium (lb.)	15c.	Free	Free
Liquidated antimony (lb.)	¾c.	Free	Free
German silver (%)	20	20	15
Nickel silver (%)	30	20	15
Copper rolls (lb.)	2½c.	2½c.	5%
Brass rods, &c. (lb.)	4c.	4c.	20%
Seamless brass tubing (lb.)	8c.	8c.	20%
Brazed brass tubes (lb.)	12c.	12c.	20%
Bronze rods and sheets (lb.)	4c.	4c.	20%
Bronze tubes (lb.)	8c.	8c.	20%
Quicksilver (lb.)	25c.	35c.	10%
Nickel in pigs (lb.)	3c.	5c.	10%
Nickel bars and sheets (%)	25	30	20
Tin in bars and pigs	Free	2c. lb.	Free
Lead bullion and pigs (lb.)	2½c.	2½c.	25%
Lead in sheets (lb.)	2½c.	2½c.	25%
Zinc-bearing ore—			
Under 10% zinc	Free	Free	10%
10@20% zinc	½c.	½c.	10%
20@25% zinc (lb.)	1c.	1c.	10%
Over 25% zinc (lb.)	1½c.	1½c.	10%
Zinc in pigs (lb.)	1¾c.	1½c.	15%
Zinc in sheets (lb.)	1¾c.	1½c.	15%
Zinc in plated sheets (lb.)	2c.	1½c.	15%
Old zinc (lb.)	1c.	1c.	15%
Other metal articles or wares (%)	40	35	20@50%

The Machine Tool Market in Italy

By LUIGI MARZOLI

The metal working industries of Italy have experienced a great deal of trouble since the end of the European war. The heavy burden of our political mistakes has struck several bad blows to the young Italian industries, and particularly to the metal working branches.

No doubt you have noticed the greatest of our industrial griefs—when the workmen seized the factories. The result, however, was morally good, because the experiment has shown plainly the impossibility of running an industrial organization under socialistic laws and regulations. Since that time our workmen have become more reasonable in their demands and more efficient in their work, and it has been possible to purge the factories of the bolshevist elements.

We now have the great evil of taxation which is altogether too high and which is a tremendous handicap to all our industries. This is not only the case in Italy, but generally throughout Europe. However, our country leads all in taxation per capita and we are confident that our powerful allied creditors will show wisdom in trading with us, and in so doing aid business relations.

Our government has voted to seize all excess war profits, and this law has resulted in great difficulty for all those firms which had invested enormous amounts of money in new plants and equipment, but the government had to satisfy the radicals. The people have been disturbed by the length of the war and the unsatisfactory results, so something had to be done, even though it added more men to the armies of unemployed.

Labor unrest, heavy taxes, and in some cases poor management have ended in a very bad situation for some of our large mechanical industries like Ansaldo and Ilva. The average condition of these industries is one of hopeful waiting for better business. Very few are working at all, and those who have orders are working with reduced forces and on short-time schedules. There has been a great scarcity of waterpower due to the very dry winter.

The motor car builders have also suffered from lack of orders, which is partly due to the high internal taxation on car licenses. Fortunately this tax has now been reduced to about one-half and the motor car industry is registering improved business. It is worth mentioning here that the automobile industry is one of the most extensive industries in Italy and the automobile factories are the most fertile market for American machine tools.

The machine tool building industry in Italy was developed very little during and since the war. Firms like Tassoni, Zust, Michele Ansaldi, Dubosch and a few others have produced some well designed tools, but altogether there is no real competition. The strongest competitors in our markets for machine tools are the German manufacturers, but as our engineers prefer American built machines I believe it would be advisable for the American machinery and machine tool builders' associations to endeavor to make a commercial treaty with Italy, and thereby assure a special low tariff on imported American machine tools. Since July 1, 1921, Italy has applied a new general tariff rate on imports of machine tools. This rate imposes a duty of from 40 to 112.50 gold liras for every 100 kilos between 5 and 10 tons. Automatic machine tools carry an extra duty of from 15 to 50 per cent, according to the weight of the machine. Small tools such as taps, dies, reamers, milling cutters and twist drills are charged according to the weight from a minimum of 100 to a maximum of 540 gold liras. This new tariff is not very high, but the difficulty is that it must be paid in gold, which under the present exchange is four times the old rate.

It has been noticeable that very little business in the machine tool line has been done in this country since the middle of the year 1920, and we do not see any signs of improvement. In 1921 there were almost no inquiries for machines of any make. The situation in the small tool market is not quite as bad, and in spite of the keen German competition American and English made tools lead in the Italian market. American and English made files dominate the Italian shops and twist drills are also exclusively of American or English make. German made twist drills are now being introduced, but past experience has proved that they are of inferior quality. In Trieste during 1920 it was impossible to sell any but the German makes of tools, mainly because of their low price, but in 1921 American and English made tools were consistently inquired for because it was learned that the average German tool was of a very low standard. Most of the German machines introduced in Italy after the war were poor copies of American built machines. Of late, though, German designs have been greatly improved.

Regarding tool steel and special alloy steel it is remarkable the laxity of almost all American and English makers, who have done nothing to hold the priority which they had in Italian markets immediately after the war. In this field the German manufacturers have displayed wonderful organization in opening large stores with plenty of stock and giving the steel users the best attention and assistance in order to popularize their several brands of tool steel.

There is one field in the mechanical industries which shows some prosperity during these dull times. That is the application of scientific instruments in our shops. The managers of our factories have come to realize the wonderful results to be obtained by the application of modern control methods and testing apparatus, and if they cannot afford to buy new machine tools they have at least kept up to date with American made instruments of this particular class.

Business Outlook in Foreign Markets

Cable dispatches and other reports coming from representatives of the Department of Commerce in foreign countries, indicate a continued, though slow resumption of business. The demand for American products is good, but is retarded somewhat by the depreciated foreign currencies and the fluctuating exchange rates.

Czecho-Slovakia shows considerable activity in the iron and steel trade. Three companies have merged their selling organizations into what is called the "Combined Iron and Steel Works," and other concerns are expected to join in the movement. The purpose of the organization is to regulate the production and marketing of iron and steel products and to encourage trade with foreign countries.

In order to promote foreign trade the syndicate reimburses domestic machine shops which purchase iron from it, to the extent of 40 crowns per 100 kilos of iron—providing the finished product was shipped abroad.

The combine was started by the Prague Iron Works and has been joined by the Vitkovice Iron and Steel Works and the Austrian Iron and Steel Works.

The Japanese government (lower house) has passed a bill providing for the rapid extension of railways all over the empire. Large sums will be expended for equipment and improved service facilities.

In Belgium, iron and steel production is gradually showing improvement. Production for February was in metric tons: Pig iron, 91,710; raw steel, 78,870; rough castings, 5,130; finished steel, 81,870; finished iron, 7,751.

In Thrace, agricultural development is calling for modern implements and especially for tractors. There are about seventy-five tractors in use there at present, one-half of these being American.

A bill recently presented to the Spanish legislature provides for reductions in duties on several items including iron, steel and machinery and equipment. It is expected that the bill will receive favorable attention.

Industrial fairs and exhibitions are to be held at Munich, Germany; Marseille, France; Valencia, Spain, and Lausanne, Switzerland, during the next few months. American products will be shown at all of these.

Welding Society Meeting

Plans have been completed for the annual meeting of the American Welding Society, to be held in the Engineering Societies Building, New York City, on April 26, 27, 28 and 29.

The program has been laid out to cover a wide range of subjects pertinent to welding operations and the speakers have been chosen from the foremost in that field. Committees on various specifications and standardizing projects will report their findings. Various kinds of welding and welding apparatus will be explained and discussions allowed so as to bring out the sentiment of the organization.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE

Editor, *Commerce and Finance*, New York

In so far as domestic business is concerned the most important event of last week was an oversubscription to an offering of $150,000,000 six months Treasury Certificates bearing interest at only 3½ per cent.

Almost concurrently the Bank of England reduced its rate to 4 per cent and, although the Federal Reserve Bank statement showed no change in the reserve ratio or otherwise, the impression is strengthened that we are in for a long period of easy money on both sides the Atlantic. In New York the best commercial paper is salable at 4½ per cent, and eligible bank acceptances are quoted at 3½, while 90-day bankers acceptances are readily marketable in London at 2½ per cent.

An early reduction in the Federal Reserve rate for rediscounts is therefore confidently expected, some issues of Liberty Bonds have sold at par or higher, the market for other bonds is described as "boiling" and both railway and industrial shares have been very responsive to rumors or announcements that could be plausibly construed as bullish.

The Trade Balance

Sentiment on the Stock Exchange has in fact become almost unanimously optimistic, and the textile strike, the coal strike and a foreign trade statement for March, which shows an excess of exports of only $74,000,000 as compared with $134,000,000 in the same month last year, have been entirely ignored.

Of course cheap money is a powerful tonic, but it is questionable whether it can permanently overcome the dispiriting influence that the idle cotton mills and coal mines exert, and if the strikes last much longer the prevailing enthusiasm over the outlook may be chilled. Thus far there is but little indication that either the employers or the employees are disposed to yield or compromise. As to our foreign trade it has been for some time evident that we could not continue to export more than we import, but there is a traditional fear of an "adverse trade balance" in the United States and however logical it may be, its psychological effect may also be "adverse."

It is, however, probable that the impetus the upward movement has acquired will enable speculators to "carry on" for some time yet and while I would again advise those who use borrowed capital in their business to cover their prospective requirements at present rates and as far ahead as possible, there is as yet no reason to expect any serious reversal in the upward tendency of the security market.

As always at such periods, there is much talk of mergers, consolidations and other "deals" to excite the public imagination, and there is good reason to expect that in so far as the railroads are concerned some important consolidations are being very seriously considered.

Turning from finance to commerce and industry the most surprising item in the week's news is the domestic cotton consumption for March, which shows an increase when everyone expected a decrease as a result of the New England strike.

This brings the total domestic consumption of cotton from Aug. 1 to April 1 to 4,002,975 bales as compared with 3,170,592 bales during the same period last year, and furnishes convincing proof of the recovery that has taken place in one of our most important industries.

Exports are also running heavier, a very serious shortage of cotton goods is reported from Germany, as well as from other Continental countries, and the outlook seems to indicate an eager demand for as much cotton as the South is likely to produce next season.

The woolen industry has also been invigorated by an interview with President Wood of the American Woolen Co. in which he stated that "we are on the very brink of prosperity." His faith in this declaration is evidenced by the action of his company in advancing woolen cloths by from 10 to 45 cents a yard. Several leaders of the steel industry have expressed themselves in the same strain as to the future of their business, and nearly all the steel fabricating plants are now at work. Raw silk and silken textiles are also higher. Coffee has gone well above ten cents a pound for May delivery. Sugar is firm despite the bearishness of some trade authorities. The National Lumber Trade Barometer says that "production is not keeping pace with the demand" and prices are higher. Building materials have again advanced. Bradstreet's estimates the authorized expenditure for new construction in March at $234,000,000, as against $118,000,000 in the same month a year ago, and a serious shortage of mechanics is reported from many of the larger cities.

Automotives Prosperous

The automobile manufacturers seem to be confident of a big demand for cars. Gasoline is higher. So is rubber, and the retail stores patronized chiefly by the women compose about the only trade group that is not confidently cheerful. Possibly the prosperity has not reached to the outermost circumference of the business circle as yet, or possibly those who buy new cars can't buy new clothes also, but when the crops are marketed the money realized will probably find its way into the tills of the retail shops.

The only serious shadow athwart the future is a tariff bill that pleases nobody, and which if passed will probably reduce our exports because it will make imports almost impossible. The bonus bill still threatens also, but there is reason to hope that the dominant element in Congress has been made more cautious by the recent by-elections in Connecticut, Illinois and New York, and that its ear is now so close to the ground that it can hear the protests of the business men against these two measures.

All other foreign developments have been obscured by the Genoa Conference, where the friction that has from time to time occurred led Lloyd George to remark that "there is nothing so explosive as a peace conference." It is too early to say what will result from the gathering, but the fact that Russia, Germany and the Allies are now at the same council table is auspicious, and despite an occasionally acrimonious interchange of views there is every reason to hope that the conference will prove to be another milestone on the road to the economic reconstruction of Europe.

This hope is encouraged by the action of the foreign exchange market, which is distinctly firmer for sterling, francs and lire.

From the cable reports it would appear that Lloyd George, John Maynard Keynes and some others at Genoa are still disposed to think that European inflation can be corrected by the "revaluation" or "devaluation" of the paper currency outstanding, but this idea is regarded as visionary and the best opinion is that it will only be possible to stabilize exchange by reopening all the world's markets to trade.

If this can be accomplished the prosperity now so generally expected will be a fact, but America will not share it unless her people and her legislators are willing to admit the truth as stated by Lloyd George when he said:

"The world is one economic unit. Economically it is not even two hemispheres. It is one round unbroken sphere."

W. N. Best, Inventor of Oil Burners, Dead

William Newton Best, president of the W. N. Best Furnace and Burner Corporation, of New York, and the holder of many patents for inventions in the oil-burning industry, died on April 11 at his home in Brooklyn. He was in his sixty-second year. He was the author of "Science of Burning Liquid Fuel" and was a fellow of the Royal Society of Arts, London, and a member of the American Society of Mechanical Engineers, the American Institute of Mining and Metalurgical Engineers, the American Institute of Metals, the American Railway Mechanics' Association and was vice-president of the Goodwill Industries of Brooklyn.

The Trend of Business Improvement—Plants Resuming

The Wincroft Stove Works, Middletown, Pa., is maintaining close to capacity production at its plant, with a night force working in a number of departments. Present orders total approximately 50 per cent in excess of those at this same time a year ago.

The Earl Motors, Inc., Jackson, Mich., manufacturer of automobiles, has resumed operations in all departments of the plant. This is the first time that production has been on this basis for a number of months.

The Timken Roller Bearing Co., Canton, Ohio, has adopted a night shift in addition to regular day operation in all departments at its plant.

The Reading Iron Co., Reading, Pa., has increased the wage scale of puddlers at its plant from $6 to $6.50 a ton. The wages of laborers have been advanced from 22½ to 24½ cents an hour. The plant is maintaining active production under regular operating schedule.

The Osgood Bradley Car Co., Worcester, Mass., will increase its working force by 300 to 500 men. The plant is operating on a 48-hour week schedule, giving employment to about 1,000 men. The company has just received an order for 98 steel coaches from the Boston & Maine Railroad, at a contract price aggregating $2,000,000.

The Warner Gear Co., Muncie, Ind., is arranging for the early resumption of operations at close to normal capacity. Additions will be made to the working force.

Dodge Brothers, Detroit, Mich., manufacturers of automobiles, are perfecting arrangements for an increase in manufacture from 600 to 750 cars per day.

The Studebaker Corporation, South Bend, Ind., manufacturer of automobiles, is maintaining full capacity operations in all departments, and in May will increase the output of closed-type cars to 100 a day, representing about 25 per cent of the production of all styles. An appropriation of $1,250,000 has been arranged for plant expansion, to include the erection of a storage and shipping building to cost about $750,000, with equipment, and a power plant to cost $500,000.

The Chickasaw Car Co., Birmingham, Ala., is increasing operations at its plant to handle current orders. The company has secured a contract for 50 cars from the Atlantic Coast Line Railway, and will repair 3,000 cars for the Seaboard Air Line Railway. Negotiations are being closed for a portion of a 2,000 freight car order from the Louisville & Nashville Railroad.

The Pennsylvania Railroad Co. has increased operations to close to normal at its Todd's Cut, Del., car shops. Two hundred men have been added to the working force during the past fortnight, bringing up the working quota to about 1,000 employees.

The Warner Corporation, Muncie, Ind., manufacturer of automobile parts, has adopted a day and night production schedule, giving employment to about 350 men. The bulk of output is for the Durant Motor Co.

The Durant Motors, Inc., New York, is operating its plants at Long Island City and Lansing, Mich., on a capacity basis, and has plans in progress for enlargements at both factories for the establishment of departments for the manufacture of the new Star automobile. It is proposed to develop a total output of 20,000 cars a month. The bulk of operations will be devoted to assembling.

The Edward G. Budd Manufacturing Co., Philadelphia, Pa., manufacturer of all-steel automobile bodies, has adopted a capacity operating schedule at its plant, with night shift working in certain departments. The company has secured sufficient orders to insure this basis of production for about ten months to come.

The General Motors Corporation is adding to the working force at its Muncie Products Co. division, Muncie, Ind. About 900 men are now employed and this number will be increased each week. Other units of the company at this place are now giving employment to approximately 600 operatives.

The Liberty Motor Car Co., Detroit, Mich., has adopted a capacity schedule at its plant, with sufficient orders on hand to insure operations on this basis until well into July. The plant was reopened in February after a shut down of a number of weeks, and has increased the output twice since this time.

The Elliott Blair Steel Co., Mercer, Pa., has inaugurated capacity production at its plant, with the employment of two shifts of workers.

The Upson Nut Co., Cleveland, Ohio, has adopted a full time, full production schedule at its bolt and nut department.

The Logan Iron and Steel Co., Burnham, Pa., has adopted a full-time operating schedule in all departments at its plant. The company has orders on hand for staybolt iron and other material for locomotive construction.

The White Motor Co., Cleveland, Ohio, is increasing operations at its plant and will add about 150 men to the present working force.

The Pennsylvania Railroad Co. is increasing the number of employees at its car and locomotive shops at Renovo, Pa., including machinists, blacksmiths, boilermakers, pipe fitters and car repairmen. Additions will also be made in the working force at the Northumberland, Pa., shops. Both plants will revert to a pre-war basis of operation.

The Southern Pacific Railroad Co., Chicago, Ill., is taking bids for the construction of 2,000 single-sheathed, steel superstructure automobile cars of 50-tons capacity, comprising the largest order for this class of equipment ever placed by a western railroad.

The Lindstrom Tool and Toy Co., 50 Silliman Ave., Bridgeport, Conn., recently added one hundred and fifty employees in the toymaking department.

The Ashcroft Manufacturing Co., Bridgeport, Conn., subsidiary of Manning, Maxwell & Moore, Inc., report increased orders, necessitating hiring additional help. The plant is working steady.

Department of Agriculture as Aid to Farmer in Selecting Machinery

Increased activity in rural engineering problems is proposed by the Department of Agriculture. Prof. E. D. Ball, director of scientific work of the department recently asked the Senate Committee on Appropriations to increase from $33,000 to $48,000 the appropriation for rural engineering work. He says this work contemplates the possibility of improving the designs of warehouses, including storage cellars for sweet potatoes, deciduous fruits, farm buildings, farm machinery, etc. With the farmer spending millions for tractors, there are requirements for farm machinery to go with the tractors.

Dr. Ball also points out that the farmer is spending a large amount of money on buildings and machinery that do not pay. The department proposes to secure a rural engineer for this work but is handicapped by the $4,500 salary limitation. The American Association of Farm Machinery Manufacturers has endorsed the work, as it desires the department to study farm machinery and determine what is a most desirable type of farm machinery to use with a certain type of tractor. At present no one knows which is the most economical type of machine or plow or harrow necessary for the tractor. There is a desire to standardize farm machinery and reduce the number of extra parts of machines. It is said that the farmers could be saved millions of dollars a year if farm machines were placed on a standard pattern so that an extra part would fit one machine as well as another.

Robinson Company Makes Safety Record for 1921

The employees of the H. H. Robinson Company plant at Ambridge, Pa. have been awarded the Rice Safety Award bronze tablet by the National Safety Council. The company has achieved what was thought to be impossible—a year without accident and no lost time by workmen through such mishaps. The award was made at the fourth annual banquet of the Western Pennsylvania division of the council, which was held in Kaufman's in Pittsburgh.

W. E. Megraw, safety director of the Robinson company, received the tablet in the name of the employees. Twenty-five members of the company's staff attended the ceremonies.

Engineers to Travel on Gas Railway Cars

The Metropolitan Section and the New England Section of the Society of Automotive Engineers will hold a joint session on April 21. The members from New York will go to New Haven via gasoline driven rail cars, through the courtesy of the New Haven Railroad. The session will be devoted to a study of this comparatively new type of rail transportation. The engineers will have luncheon at the Yale University Dining Club at noon and will be addressed by Prof. Lockwood of the Yale laboratories.

Legislation To Convert Battleships to Airplane Carriers

The House Committee on Naval Affairs in reporting the naval appropriation bill for the year beginning July 1, 1922, recommends that two of the battleships and two of the battle cruisers to be scrapped under the naval limitations treaty, be converted into airplane carriers.

It gives the comparative costs for hull and machinery for completing the battleships and cruisers and for converting them into carriers for airplanes. It estimates that it would cost $115,000,000 for hull and machinery to complete the two battleships and the two battle cruisers and fifty-nine smaller vessels. To alter and complete two battle cruisers as aircraft carriers would cost for hull and machinery $31,887,000. It estimates that it would cost $48,000,000 for hull and machinery to build two aircraft carriers complete.

The Navy had estimated $53,000,000 for construction and machinery for naval vessels which was made unnecessary by the naval limitation treaty.

The bill, introduced by Represented Butler on April 7 follows:

A BILL

Authorizing the president to Scrap Certain Vessels in Conformity with the Provisions of the Treaty to Limit Naval Armaments, and for Other Purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress Assembled, That for the purpose of giving effect to the provisions in the treaty to limit naval armament, concluded Feb. 6, 1922, by the United States of America and the British Empire, France, Italy, and Japan, respecting the abandonment of shipbuilding programs and the scrapping of capital ships in excess of the number which the United States may retain in conformity with the said provisions, the President of the United States be, and he is hereby, authorized to make such disposition, as in his judgment may be proper, of any capital ship of the Navy built or building and to cause to be taken such action as is necessary for the scrapping of capital ships to be dealt with in that manner in accordance with the said provisions.

Sec. 2. That the President of the United States is hereby authorized and empowered to discontinue the construction of and to cancel or modify any contract entered into for and on behalf of the United States for the construction of seven of the first-class battleships and the six battle cruisers authorized in the Act entitled "An Act making appropriations for the naval service for the fiscal year ending June 30, 1917, and for other purposes," approved Aug. 29, 1916, and for the machinery, materials, equipment, armor, armorment, and ordinance equipment therefor: *Provided,* That whenever any such contract is canceled or modified just compensation therefor shall be made in the manner and upon the basis provided in the Act of July 1, 1918, entitled "An Act making appropriations for the naval service for the fiscal year ending June 30, 1919, and for other purposes," out of any funds hereafter to be appropriated for that purpose.

Sec. 3. That of the battle cruisers authorized in the Act entiled "An Act making appropriations for the naval service for the fiscal year ending June 30, 1917, and for other purposes," approved Aug. 29, 1916, the President of the United States is hereby authorized to undertake the conversion of the two battle cruisers now building which in his judgment are furthest advanced in construction, or will be the most economical to convert into airplane carriers, within the limits of cost heretofore authorized for said battle cruisers; and the President is hereby further authorized to utilize any such funds and materials that may be on hand or under contract at this time for the construction of battle cruisers heretofore authorized.

Proposed Merger of Machine Tool Concerns

THE proposed merger, mention of which was made in the March 23 issue, has not gone through.

An announcement has been made by the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, that it is not in any merger or combination, but will be operated independently as in the past, under the management of J. Wallace Carrel, vice-president and general manager.

A similar announcement has also been made by the Carlton Machine Tool Co., of Cincinnati. This company will continue to be operated independently under the management of Jack C. Carlton, president and general manager.

Chicago Letter

There is a rather cheerful spirit of optimism among the machine tool dealers in the Chicago district and according to all indications April promises to far exceed the past three months in the amount of business. In general, the orders booked are from widely scattered sources and very few of them are large.

No reports have come of the railroads buying in the past week, although their inquiries for machinery have become more pronounced. As usual the list is topped by the Santa Fe. This road has added some thirty or thirty-five machinery requirements to its outstanding list. An extensive list from the Illinois Central remains among the expectations of the dealers. This road, however, recently purchased a 15-ton pillar crane from the Whiting Corporation.

Activities continue strong in the steel industry. Last month was looked upon as a banner month.

Building permits for 1,327 buildings involving a cost of $19,333,900 were issued in Chicago during March. This cost practically exceeded all others since August, 1911. The marked increase in construction was also felt in other lines; for instance the Common Brick Manufacturers' Association of America, in its monthly digest, reports that the deliveries of brick through the months of February and March were at a rate that promises a season's output closer to normal than has been experienced in the last two years. This sounds a little like a statement made by a local manufacturer and dealer in machine tools to the effect that he could, after many months, truthfully say that business was satisfactory and somewhat pleasing.

The Rail Joint Company received an order for a number of 100 per cent rail joints from the Chicago, Indianapolis & Louisville R.R.; one for 1,250 rail joints from the Chicago & Eastern Illinois R.R.; and another for 18,000 joints from the Atchison, Topeka & Santa Fe. There is also a report that the Illinois Steel Company received an order from the Wabash Railroad for 160,000 tie plates.

The entire assets and liabilities of the L. A. Allthoff Co., of Illinois, have been taken over by the L. A. Althoff Manufacturing Co., Inc., Laporte, Ind. It is understood the corporation recently completed a plant and is in the market for a few machine tools and other equipment.

The Crown Foundry Co., East Peoria, Ill., a recently incorporated concern, is erecting a plant at East Peoria, and will manufacture gray iron, chilled and semi-steel castings. This company is in the market for complete equipment for the new plant.

A slight ray of hope has been placed by the machine tool dealers on the recent rumor of an increase in the price of steel.

Cleveland Letter

Another indication of the comeback in industry in the Cleveland, Ohio, district, is the announcement last week that the Sterling-Knight Motor Company is preparing to produce the Sterling-Knight automobile at an early date. Negotiations for the purchase of the Accurate Machine Company's plant, in the east end of the city, were completed. This part of the project alone involves $1,000,000 officials state. The company is headed by P. H. Withington, and the mechanical developments are under direction of J. G. Sterling, formerly chief engineer of the F. B. Stearns Company, of Cleveland. It is planned to build the complete chassis of cars in the plant. Already 200 cars have been sold, officials assert. Plans call for starting deliveries during August.

Plans for opening its Canton, Ohio, plant are being considered by officials of the Hydraulic Pressed Steel Company, of Cleveland. Both Cleveland plants are running day and night forces since the number of orders for steel building material, automobile parts and the like have increased.

Test of Airplane Wing in Flight

A full-sized airplane wing suspended below an airplane in high-speed flight will be tested at the Langley Field laboratory of the National Advisory Committee for Aeronautics. This will be the first time that a real wing has been tested in actual flight, and is the final step of developing a new method of testing the performance and lifting properties of airplane wings.

The method recently demonstrated successfully with model wings in air flights, consists in carrying the wing to be tested below an airplane in flight and, by means of suspension apparatus and recording instruments, to measure the forces of lift and resistance directly from the wing.

A complete airplane cannot be tested in flight as there is no means nor method of measuring the factors desired; there is nothing to suspend the plant from and its lift or pull cannot be measured by instruments carried on the plane itself.

Business Items

Announcement has been made of the division of the Lynn, Mass., works of the General Electric Company into two sections, to be known as the West Lynn Works and the River Works. F. P. Cox has been appointed manager of the West Lynn Plant and Nelson J. Darling manager of River Works, both succeeding Richard H. Rice, deceased, who formerly exercised control over the entire plant.

The stockholders of the Century Machine Co., Holyoke, Mass., have voted in favor of a plan to reorganize the company and largely increase the capital stock. The company manufactures machines for washing and sterilizing dishes and glasses.

The Palmer Steel Co., has been formed at Holyoke, Mass., with $100,000 capital, to design, fabricate and erect steel structures in the nature of bridges and buildings. It is stated that the concern has bought its machinery and will soon let the contract for a one-story building 80 x 200 ft., to be located in Williamsett, a suburb of Holyoke. Earl Palmer of Memphis, Tenn., is president of the company; Wayne E. Palmer of Holyoke is treasurer, and Raymond E. Palmer of 316 High St., Holyoke, is vice-president and general manager.

The Holyoke Water Power Co., Holyoke, Mass., is preparing plans for the electrification of the headgates at its big dam on the Connecticut. Hitherto they have been operated by a Boyden waterwheel and this will be retained for emergency use. The headgates are thirteen in number, and are operated singly. The company has filed plans for two electrical sub-stations, one to cost $900 and the other $400.

The Monarch Machine Tool Co. is considering the installation of a sprinkler system in its plant at Sidney, Ohio.

The Vaughn & Son Boiler and Machinery Co., Joplin, Mo., has purchased the firm of Robbins & Long, same city. The two plants will be combined at the Vaughn works on Grand Ave.

The Whiting Corporation, of Harvey, Ill., has moved its Chicago sales offices from 1245 Marquette Bldg. to 945 Monadnock Bldg.

The East plant of the American Tube and Stamping Co., in Bridgeport, Conn., will reopen about the middle of May. This plant has been closed since February, 1921. At a recent meeting of the directors of the company Edmund C. Mayo was elected president; F. Kingsbury Curtis, vice-president; C. P. Miller, treasurer; W. L. Warrell, secretary. New directors chosen were W. L. Abbott, R. F. Cutting, W. B. Day, C. L. Dimon, F. J. Kingsbury, E. E. Macy, J. V. W. Reynders, C. J. Sanford, Carlton Macy and W. R. Webster.

The New England Tube and Stamping Co., Inc., West Haven, Conn., has been incorporated under the laws of Connecticut, to manufacture automobile accessories, metal tubes and machine parts, sheet metal goods, etc. The capital stock is $200,000. The company will operate in the plant of the Coe-Stapley Manufacturing Corporation, the assets of which were recently purchased by P. J. Holdsworth, of New York. The incorporators of the new company are Mr. Holdsworth; J. M. Harding, 178 Lawrence St., New Haven, Conn.; and Robert R. Adams, Bridgeport, Conn.

The Connecticut Marine Boiler Works Co., 64 Kossuth St., Bridgeport, Conn., recently added the manufacture of a combination metal door and lock, to its present business. The door and lock has been patented by Mr. Wilson, president of the company, who states that his company already has an unusual large order for the product. The company will also engage in the manufacture of tin and galvanized iron appliances.

The assets of the Hartford Automotive Parts Co., Broad and Lawrence Sts., Hartford, Conn., will be disposed of by public auction at the offices of the company on May 3rd. The trustee states that no bid under $325,000 will be considered.

The Dalton-Ingersoll Manufacturing Co., manufacturer of plumbing goods, etc., Boston, Mass., has recently removed from 175 High St., into more commodious quarters at 365 Atlantic St.

The Welker Manufacturing Co., Middletown, Conn., has recently been incorporated to manufacture metal specialties. The capital stock is $50,000, and the incorporators are: O. B. Welker, 199 South Main St.; F. A. Beach and F. B. Fountain, all of Middletown.

John E. White was chosen president and general manager of the Graton & Knight Manufacturing Co., Worcester, Mass., at the recent annual meeting. Mr. White succeds Walter M. Spaulding, who has been elected chairman of the board of directors. Five men were elected to the board of directors. They are: Harry G. Stoddard and Dr. Homer Gage, of Worcester; Stanley A. Russell, George B. Greene and W. R. Grace, of New York city.

At the annual meeting of stockholders of the American Electric Fusion Corporation, Chicago, Ill., it was decided to increase the capital stock of the concern to $40,000. New officers elected were: E. J. Henke, president; A. B. Bonneborn, vice-president; S. F. Strand, secretary-treasurer.

The Everyday Piston Ring Co., Inc., has purchased the building formerly occupied by the Kleen Sweet Products Co., at Commercial & Roosevelt Streets, Rochester, N. Y. The company has made many alterations to building and has installed specially made machinery and equipment for the manufacture of piston rings. Officers of the company are: George E. Burgess, president; F. E. Paige, vice-president and general manager; E. H. Perkins, secretary and treasurer.

The Rockford Milling Machine Co., Rockford, Ill., has made the following announcement: The Mid-West Machinery Exchange, Kansas City, Mo., will handle in the Kansas City territory the complete line of Sundstrand lathes, manufactured by the Rockford Tool Co. The English Tool and Supply Co., Kansas City, Mo., will handle the cone-drive millers. The Peden Iron and Steel Co., Houston, Texas, will handle the Rockford line exclusively in the state of Texas; the Greensboro Supply Co., Greensboro, N. C., will handle the Rockford line exclusively in North and South Carolina.

Personals

EDWARD BLAKE, JR., vice-president of the Greenfield Tap and Die Corporation, who has been general manager of the organization's drill plant at Taunton, Mass., has been placed in charge of sales and will hereafter make his headquarters in Greenfield. Mr. Blake was connected with Wells Bros. for several years and at one time was vice-president and general manager of the Lincoln Twist Drill Co., before that concern was sold to the Greenfield corporation.

K. W. ZIMMERSHIED has been appointed to assist P. S. DuPont, president of the General Motors Corporation.

WILLIAM S. KNUDSEN has been elected vice-president of the Chevrolet Motor Co. He will be in charge of operations.

DONALD MCSKIMMON has been elected treasurer of the J. T. Slocomb Co., Providence, R. I.

JOHN G. WOOLCOTT has been appointed buyer of the E. W. Webb Manufacturing Co., manufacturer of plumbers' goods, Boston, Mass. Mr. Woolcott succeeds C. W. Coleman, who recently resigned.

VOORHIES HAIGHT, formerly of the sales department of the Bridgeport Brass Company, Bridgeport, Conn., has accepted a similar position with the Waterbury Manufacturing Co., Waterbury, Conn.

M. W. MELROSE has opened a machine shop in the Washington Garage, Brookline, Mass., where he will do cylinder grinding, crankshaft grinding and toolmaking.

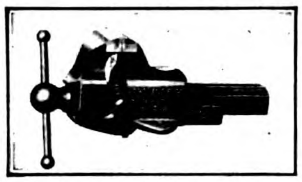
HARRY C. KINNE, head of the engineering department of Bagley & Sewall Co., manufacturers of paper mill machinery, has returned to Watertown from a 10,000-mile business trip through the Western States. In commenting on business conditions governing the machinery interests, Mr. Kinne stated

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

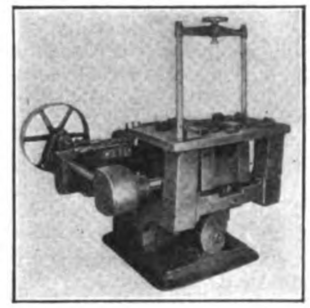
Vise, Bench, U-Beam
Athol Machine and Foundry Co., Athol, Mass.
"American Machinist," Jan. 5, 1922

The vise has jaws of tool steel and a screw of the buttress type operating in a malleable-iron nut. The beam, eye and ball are unfinished. The vise is made in four sizes, with widths of jaws of 2½, 3, 3½ and 4 in. The jaw openings are, respectively, 3½, 4½, 5½ and 6 in., and the weights 13, 21, 30 and 37 pounds.



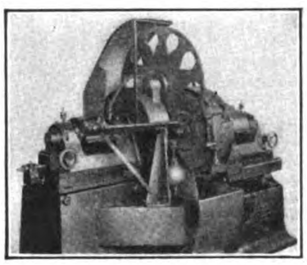
Milling Machine, Straddle, Cycle-Feed Type, C-75
Newton Machine Tool Works, Inc., Philadelphia, Pa.
"American Machinist," Jan. 5, 1922

The machine is used in facing the bearings for crankshafts in automobile cylinder blocks. It is driven by a belt. The two spindles have individual hand adjustment for setting the face-milling cutters. The motion of the table is a rapid advance downward, a slow feed for the cut and an upward quick return to the loading position, where the table automatically stops on the level of the conveyor rolls. The table is provided with hardened steel jig plates. The rate of feed, or the time of one cycle, may be varied.



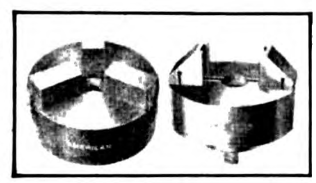
Grinding Machine, Automatic, Double, No. 1
Gardner Machine Co., Beloit, Wis.
"American Machinist," Jan. 5, 1922

The machine is adapted to rapid grinding of piston rings, ball and roller bearing races, sad-iron sole plates, thrust washers and similar parts. The openings in the work carrier can be made to conform to the shape of the work. The carrier is provided with a range of feeds from six to forty pieces per minute. A handwheel adjusts the grinding members. Provision is made for accurately aligning the spindles of the machine. Steel collars carry the thrust. When grinding small work at a high rate of feed, an automatic feeding device for the carrier is employed.



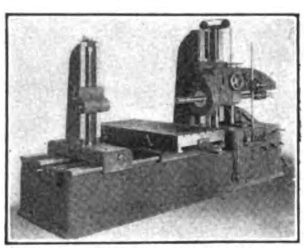
Chucks, Air-Operated, "American"
S-P Manufacturing Co., 872 East 72d St., Cleveland, Ohio
"American Machinist," Jan. 5, 1922

The standard sizes of the chucks range from 6½ to 18 in. in capacity, but larger chucks can be furnished. In the accompanying illustration are shown the three-jaw and two-jaw combination chucks. Special jaws or master slides to take false jaws can be furnished. The chuck bodies are made of one-piece semi-steel castings. The strain of the work bears on the end of the machine spindle. The air may be shut off in the cylinder and the work still firmly held. The chuck can also be hand operated.



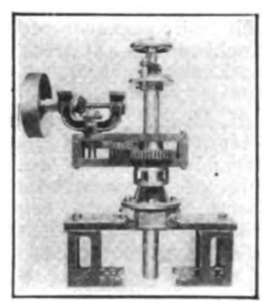
Boring Machine, Horizontal, "Tri-Way"
Universal Boring Machine Co., Hudson, Mass.
"American Machinist," Jan. 5, 1922

In this machine three instead of two guiding ways are provided for the carriage. The lever controls are grouped in the head end. The base extending beyond the head provides a rigid support for the motor. All speed and feed change gears are located in two flat removable trays. The bar-carrying heads move up and down simultaneously and can be fed by power in either direction. Power crossfeed is provided for the table, as is also power traverse to the carriage. Automatic knockouts are provided. The machine is made in two sizes, with three lengths of bed. Spindle speeds, 7 to 284 r.p.m. Feeds, ⅛ to 5⅝ in. per minute. Floor space, 17 ft. x 9 ft. 5 in. Height, 8 ft. Weight, 20,000 pounds.



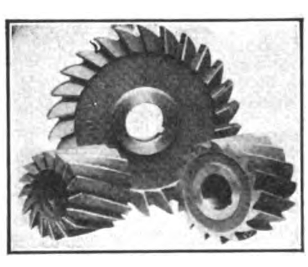
Boring Unit, Portable
Pedrick Tool and Machine Co., 3638 North Lawrence St., Philadelphia, Pa.
"American Machinist," Jan. 5, 1922

The device consists of the bar, the feed mechanism, the driving gear and the crosshead mechanism. The bar is 3 in. in diameter and 3 ft. long, and has a travel of 18 in., while the lower end of the bar is bored out with a taper hole to hold tools. By blocking the motion of the handwheel, the feed becomes automatic. Two changes of feed are ordinarily provided, although three may be furnished for special work. Power may be applied by belt, motor, or hand. The crosshead supports the guide for the bar. Space blocks provide room between the work and the end of the bar. Setscrews center the bar in the hole.



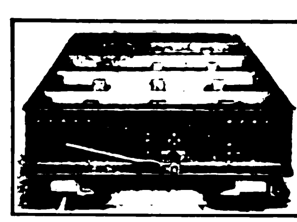
Milling Cutters, "Parabolic"
National Twist Drill and Tool Co., Detroit, Mich.
"American Machinist," Jan. 5, 1922

The cutter tooth to give uniform strength throughout is a parabola slightly modified at the small end. The number of teeth used is nearer to that of the conventional fine-tooth cutter than that of the coarse-tooth type. To secure the most effective chip thickness per tooth without excessive peripheral speed, a fairly large number of teeth was found desirable. The parabolic cutters are made in plain side and end-mill types, as well as in special designs.



Tables, Truck, Work
Edwin Harrington, Son & Co., Inc., Philadelphia, Pa.
"American Machinist," Jan. 5, 1922

The table is used with straight-rail or fully adjustable multiple-spindle drilling machines for moving the work from under the machine entirely, or in small steps to obtain any desired indexing. The device may be furnished with any surface dimensions, number of wheels, character of top surface or method of movement. It can be supplied with a cast-iron top with T-slots and pin holes. On the inside of the frame vertical slots hold 4 x ½-in. work-supporting bars, which are covered with planks, so that the cutting tools may easily penetrate. A hand ratchet lever at the front drives the front wheel of each truck. A compound-wound direct-current motor controlled by a push-button automatic starter can be mounted below the table and geared to the drive wheel shaft, to move the table 60 in. per minute.



Clip, paste on 3 x 5-in. cards and file as desired

that the Western States were where the Eastern section of the country was six months ago.

F. G. BATCHELOR, formerly with the Union Twist Drill Co., Athol, Mass., has gone to the Lincoln Twist Drill Co., Taunton, as superintendent of plant equipment.

At the last meeting of the Engineering Club of the Greenfield (Mass.) Tap & Die Corporation a purse of gold was presented to James F. Dunnigan, who has been in the employ of the concern for fifty years.

CHARLES C. RAMSDELL, vice-president of the Gilbert & Barker Manufacturing Co., has been made a director of the Union Trust Co., Springfield, Mass.

CHARLES WOODWARD, secretary of the Industrial Association of Cleveland, recently addressed the Rochester Industrial Management Council, Rochester, N. Y. His topic was "Industrial Leadership."

BYARD L. CLEGG, machine tool engineer of the Westinghouse Electric and Manufacturing Co. gave an illustrated lecture on March 28, to the students of the Brooklyn Edison Co. School on the subject "The Application of Electric Motors and Control to Machine Tools."

FRANK DUBSKY, for eight years with the transformer engineering department of the General Electric Co. in Pittsfield, has been appointed chief electrical engineer for Kolben & Co., in Prague, Czecho-Slovakia, and will begin his new duties on July 1.

E. A. MOORE, president of the Stanley Works, New Britain, Conn., has been elected a director of the Colt's Patent Firearms Co., of Hartford, Conn.

CHARLES R. HARE, for several years production superintendent of the New Britain Machine Co., New Britain, Conn., has been promoted to general superintendent.

HERBERT H. PEASE was elected president and treasurer of the New Britain Machine Co., at the meeting of the stockholders held last week. Abram Buol resigned as vice-president.

H. M. DARLING has resigned as superintendent of the Bicknell-Thomas Co., Greenfield, Mass., and has opened a shop of his own, where he will build special machinery, tools and dies. He will be located at 90 Wells Ave., Greenfield, Mass.

J. A. LEIGHTON has renewed his connection with the Lucas Machine Tool Co., Cleveland, Ohio, and will have charge of the Eastern territory.

R. S. COOPER, vice-president and general manager of the Independent Pneumatic Tool Co., Chicago, Ill., will sail from New York on April 22 for Europe. He will spend some time visiting the company's agencies and branch offices in Continental Europe.

W. C. AMES has been appointed district sales manager in the Chicago territory for the Sharon Pressed Steel Co., of New York. He will be located at 20 East Jackson Blvd., Chicago.

RALPH E. PHILLIPS has been appointed district sales manager in New York for the Sharon Pressed Steel Co.

H. R. HENRY has been appointed general sales manager of the Standard Motor Car Co., Columbus, Ohio. He was formerly connected with the Hudson-Essex interests.

ELMER MACDOWELL, of Leroy, N. Y., sailed from New York on April 13 for Japan, to become foreign manager of the American Aluminum Co. Mr. MacDowell's headquarters will be at Tokio. The company's designation for this branch is the Asia Aluminum Co.

HARRISON W. FITZGERALD, mechanical engineer with the Donner Steel Co., has been elected president of the Village of Hamburg, N. Y.

JAMES F. DOLAN, formerly division superintendent of the Willys-Morrow Corporation's plant at Elmira, N. Y., has left that connection and is now with the International Motor Co., New Brunswick, N. J.

DEXTER S. KIMBALL, Dean of the College of Engineering, Cornell University, and president of the A. S. M. E., has been appointed a member of the board of visitors of the U. S. Naval Academy at Annapolis. The appointment is for one year.

RALPH BARSTOW, general sales manager of the Greenfield Tap and Die Corporation, has established himself in business in New York City. Mr. Barstow, with his partner Marquis Regan, will conduct a marketing and merchandising business at 21 East 40th St.

Obituary

BERTRAM LAMOND, manager of the plant of Lamond Bros., Washington, D. C., was instantly killed in that plant on April 6. A part of Mr. Lamond's clothing was caught in a machine and he was drawn into the gearing before the power could be shut off.

WALDO A. LOUD, president of the Worcester Lawn Mower Co., manufacturers of lawn mowers and agricultural implements, Worcester, Mass., dropped dead in that city on April 4. Death was due to heart failure.

Trade Catalogs

Files of Precision: American Swiss File and Tool Co., sales office Edward P. Reichhelm, New York City, N. Y. An interesting booklet giving a history of the making of Swiss files and the company manufacturing them. It is put up in very handy form, and the information is arranged in an easily read manner. Several pages of illustrations are given, showing the special features of American-Swiss files and offering comparisons with other commercial makes. Another section is devoted to "How to Order" files; it gives some valuable suggestions to aid the purchaser in ordering files. A list of dealers is included.

Truck Platforms. Standard Pressed Steel Co., Jenkintown, Pa. A four-page circular describing the "Hallowell" steel lift truck platforms. The construction of the platform is illustrated in detail.

Monitor Thermaload Starter. Monitor Controller Co., Baltimore, Md. An advance introduction to the company's Bulletin No. 101, describing the Monitor thermaload starter for single and polyphase motors.

Quigley Fuel Systems. The Hardinge Company, New York, N. Y. Bulletin No. 13 describing methods of preparing, transporting and burning fuel. The book contains a wealth of valuable information on this subject, as well as useful data on heat-treating and metallurgical operations.

Dirt and Dust. Midwest Steel and Supply Co., New York, N. Y. A six-page circuar describing the Midwest unit air filters.

Black & Decker Tools. Black & Decker Manufacturing Co., Baltimore, Md. A miniature catalog describing and illustrating the B & D electric drills, screwdrivers, wrenches, grinders, cleaning machines and valve grinders.

Sawing Machinery. Oliver Machinery Co., Grand Rapids, Mich. Bulletin No. 5 containing some interesting data for those who have to do with circular saws or sawing machinery. It is illustrated with many photographs of actual sawing operations.

Manley Portable Hoists. The Manley Manufacturing Co., York, Pa. Bulletin No. 78 describing a line of portable hoists for use in garages and repair shops.

Automatic Stokers. The Combustion Engineering Corporation, New York, N. Y. A folder describing the company's Type K automatic stoker for small plants. The company has also issued a booklet on the application of pulverized coal to locomotives. This is known as the "Lupalco" system and examples of its use and its success are given in the booklet.

Forthcoming Meetings

American Gear Manufacturers' Association: Sixth annual meeting, Buffalo, N. Y., April 20 to 22. Secretary, F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Southern Supply and Machinery Dealers Association: Annual meeting, Birmingham, Ala., April 24 to 26. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, A. M. Smith, c/o Smith-Courtney Co., Richmond, Va.

National Machine Tool Builders' Association: Spring Convention, Hotel Traymore, Atlantic City, N. J., April 25, 26 and 27. Ernest F. DuBrul, 817 Provident Bank Bldg., Cincinnati, Ohio, general manager.

National Research Council: Annual meeting of executive board, April 26, Washington, D. C. A. D. Flinn, 29 West 39th St., New York City, chairman.

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

American Welding Society: Annual meeting, Engineering Societies Building, New York City, April 26 to 29.

National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York City, May 8, 9 and 10. Secretary, George Boudinot, 50 Church St., New York.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

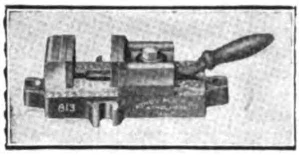
Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

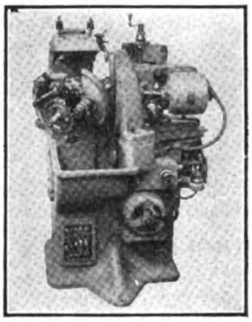
Patented Aug. 20, 1918

Vise, Milling Machine, Quick-Acting
Athol Machine and Foundry Co., Athol, Mass.
"American Machinist," Jan. 5, 1922



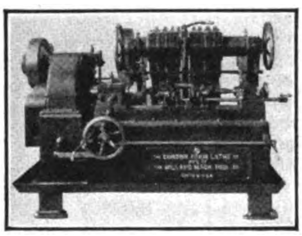
The vise is adaptable to use on drilling and milling machines. The movable jaw is operated by a lever and has a range of from 1/16 to 5 in. The jaws are 3 in. wide, and consist of hardened steel plates held in place by screws. Special jaws can be furnished to suit the work, for more rapid clamping. The cast iron bed is 10 in. long, 6 in. wide, and 2⅜ in. high. Four lugs are provided for clamping the vise to the table of the machine, and keyways are cut in the base. The cast-steel clamping lever acts on a ⅝-in. steel bolt. Weight complete, 10¾ lb.

Gear Generator, Spiral Bevel, 4-In.
Gleason Works, Rochester, N. Y.
"American Machinist," Jan. 5, 1922



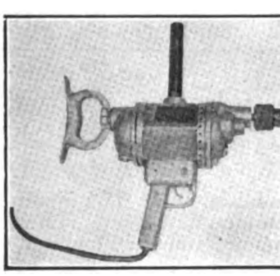
The machine is intended for manufacturing small gears in large quantities and for finishing the teeth from the solid. The feed motion is given to the cutter spindle carrier only. One motor drives the cutter and the other the feed and roll. Indexing is automatic and is actuated from the roll motion. The machine can also be used with a reduced roll to rough out gears of larger pitches. The cutters range in diameter from 1 1/16 to 3½ in. The small cuters are solid with four blades, two cutting outside and two inside. The larger cutters have eight adjustable blades, four cutting inside and four outside. Floor space, 33 x 46 in. Weight, 2,000 pounds.

Lathe, Turning, Crankcheek, Gordon
Willard Machine Tool Co., Cincinnati, Ohio
"American Machinist," Jan. 5, 1922



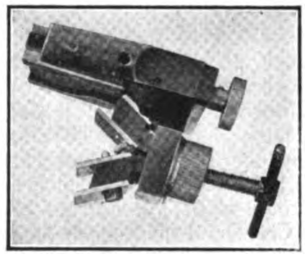
The machine is used to turn all the crankcheeks of a six-cylinder crankshaft simultaneously. The circular cutting tools are held in toolblocks which rotate in rocker arms. The work is fed past the cutting tools by a screw. A range of feeds is provided through the gear train. The machine is controlled by two horizontal levers at the ends of the shaft. The feed is engaged by the vertical lever, and disengaged by an automatic trip. Drive is through a friction clutch and two intermediate gears to the main intermediate shaft. The 3-in. circular cutter is mounted on a ⅞-in. stud, and adjusted by means of a worm locked in the toolblock which meshes with hobbed teeth in the cutter.

Drill, Electric, Portable, Special, ½ In.
Black & Decker Manufacturing Co., Baltimore, Md.
"American Machinist," Jan. 5, 1922



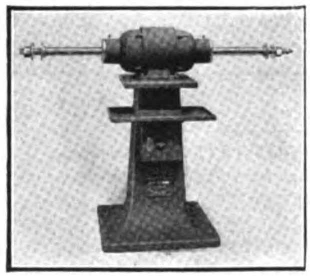
The drill has a capacity of ½ in., possesses a pistol grip, a trigger switch and a universal motor for either direct or alternating current. It is supplied for 110-volt current, but can be furnished for 220 or 32 volts. A cooling fan is keyed to the armature shaft. The chrome-nickel-steel reduction gears are of stub-tooth form, and run in grease. A three-jaw geared nut chuck, capable of holding straight-shank drills up to ½ in. in diameter, is furnished. The drill is provided with 15 ft. of electric cable, attachment plug, combination spade handle and breast plate, and detachable side handle. Weight 15 pounds.

Wheel-Truing Head, Permanent-Alignment
Precision and Thread Grinder Manufacturing Co., 1 South 21st St., Philadelphia, Pa.
"American Machinist," Jan. 5, 1922



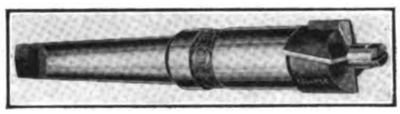
The head can be used on all "Precision" thread grinding machines by attaching it to an extended cap for the front bearing. It can be inclined to the helix angle of the thread. A stop, provided for positioning the main slide, can predetermine the amount of flat left on the face of the wheel for grinding U.S.S. threads. The diamonds are simultaneously traversed by turning the T-handle, but as one diamond is set in advance of the other they do not cut at the same time. The diamond holders are set at an angle of 10 deg. to the planes of the slides.

Buffing Machine, Motor-Driven, Electric, A.C.
J. G. Blount Co., Everett, Mass.
"American Machinist," Jan. 5, 1922



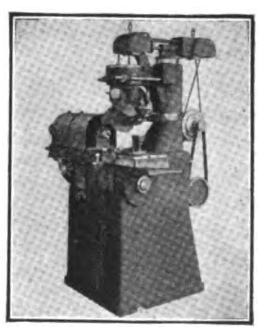
The machine is built in four sizes, ½ hp. for wheels 6 x ¾ in., 1 hp. for wheels 8 x 1 in., 2 hp. for wheels 10 x 1½ in., and 3 hp. for wheels 12 x 2 in. The head or motor unit is mounted with a pan on a column, but may be supplied on a bench base. A tool tray is bolted to the column, and a safety switch having a thermal cutout is mounted on the column beneath the tool tray. The machine is supplied for the following currents: The ½-hp. motor for 110 or 220-volt, 60-cycle, single-phase current, and the 1, 2 and 3-hp. motors for 220, 440 or 550-volt, 60-cycle two or three-phase current.

Facing Tool, Spot, Junior
Eclipse Interchangeable Counterbore Co., 1618 St. Aubin Ave., Detroit, Mich.
"American Machinist," Jan. 5, 1922



The tool comprises a nickel-steel shank and holder, an externally and internally threaded pilot-nut screwed into the holder, a high-speed steel facing cutter and a machine-steel pilot. The cutter is positively driven by flats on the shank engaging with a slot in the holder. The pilot nut is screwed into the holder and the threaded end of the pilot is screwed into the nut, thus binding the cutter in place. Holders are made with Morse tapers Nos. 2, 3 and 4 for facing cutters from ½ to 1⅛ in., 1¼ to 1⅞ in., and 1⅞ to 3 in., respectively.

Grinding Machine, Hob-Sharpening, Automatic
Barber-Colman Co., Rockford, Ill.
"American Machinist," Jan. 5, 1922



The machine was designed primarily for sharpening hobs up to 4 in. in diameter and 4 in. in length, but can also be used for sharpening formed cutters. The work-arbor spindle, provided with a No. 8 B.&S. taper hole, runs in ball bearings. Indexing is positive and automatic. The rotary motion for helical work is imparted by an adjustable swiveled guide. The work is fed to the grinding wheel at the completion of each revolution of the hob, the motion being controlled by a thumbscrew regulator. The feed can be stopped automatically after grinding any predetermined amount. The machine is regularly belt driven and a countershaft is furnished. Floor space, 42 x 50 in. Height, 72 in. Weight 2,250 pounds.

Clip, paste on 3 x 5-in. cards and file as desired

The Weekly Price Guide

THIS WEEK'S MARKET

Advances—Steel sheets, blue annealed No. 10, $2.25@ $2.40, Pittsburgh, as against $2.25; black No. 28 at $3@ $3.15 instead of $3, and galvanized No. 28 at $4@$4.15 compared with $4 per 100 lb. last week.

New York quotes advance of 25c. on black sheets No. 28 and 35c. per 100 lb. on galvanized. Electrolytic copper up ½c.; tin 1c.; lead and antimony ¼c. per lb. Raw linseed oil quoted at 84c. as against 82c.@83c. per gal. in 5 bbl. lots.

Cleveland quotes advances of ¼c. on old lead and zinc; ½c. on No. 1 yellow brass turnings.

Declines—Coke plates, bright, down 1c.; old copper ½c. and light brass ¼c. per lb. in Cleveland warehouses.

Market Firmer—Structural steel quoted at a minimum of $1.50 per 100 lb., Pittsburgh; steel prices tending upward, especially in semi-finished material. Bolts, nuts, rivets and other shop supplies considerably firmer in tone; cutting under the regular price quotations having entirely disappeared. Market firmer in sheet bars, pipe, tin plates, steel wire products, strip steel, zinc and linseed oil.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21.00
Northern Basic	21.02
Southern Ohio No. 2	21.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.87
BIRMINGHAM	
No. 2 Foundry	16.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22.26
Virginia No. 2	28.74
Basic	20.25
Grey Forge	21.00
CHICAGO	
No. 2 Foundry local	20.70
No. 2 Foundry, Southern, sil 2.25@2.75	22.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.46
Basic	20.46
Bessemer	21.46

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	11.0	7.0	4.0
Philadelphia	8.0	5.0	2.65
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Denver	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	9.0	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25@2.40	3.28	3.10	3.38
No. 12	2.30@2.45	3.33	3.15	3.43
No. 14	2.35@2.50	3.38	3.20	3.48
No. 16	2.55@2.70	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85@3.00	4.05	3.55	3.95
Nos. 22 and 24.	2.90@3.05	4.10	3.60	4.00
Nos. 25 and 26.	2.95@3.10	4.15	3.65	4.05
No. 28	3.00@3.15	4.25	3.75	4.15
Galvanized steel sheets:				
Nos. 10 and 11.	3.00@3.15	4.25	3.75	4.15
Nos. 12 and 14.	3.10@3.25	4.35	3.85	4.25
Nos. 17 and 21.	3.40@3.55	4.65	4.15	4.55
Nos. 22 and 24.	3.55@3.70	4.80	4.30	4.70
No. 26	3.70@3.85	4.95	4.55	4.85
No. 28	4.00@4.15	5.25	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.56	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	4.98
Cold finished shafting or screw	3.35	3.00	3.15
Cold finished flats, squares	3.85	3.50	3.65
Structural shapes (base)	2.48	2.31	2.38
Soft steel bars (base)	2.38	2.21	2.28
Soft steel bar shapes (base)	2.38	2.21	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.48	2.31	2.38
Bar iron (2.00@2.10 at mill)	2.38	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
$\frac{3}{32}$	8.00		12@13
⅛	6.50		11@12
$\frac{5}{32}$ to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.62½
Tin, 5-ton lots, New York	31.00
Lead (up to carlots), St. Louis, 5.15; New York	5.50
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.25	6.50	6.25
Copper sheets, base	19.50@20.50	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.25	16.00	15.75
Brass wire (carlots)	16.75	17.75	.....
Zinc sheets (casks), (8% dis. carlots)	9.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	..
Solder (½ and ½), (caselots)	18.00	22.00	19.00
Babbitt metal (best grade)	30.80	39.50	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	9.50	9.25
Copper, light, and bottoms	8.50	8.50	8.25
Lead, heavy	3.75	3.75	3.65
Lead, tea	2.75	2.75	3.00
Brass, heavy	5.75	5.50	8.00
Brass, light	4.25	4.00	4.75
No. 1 yellow brass turnings	5.00	5.50	5.00
Zinc	2.75	2.25	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	11.00	14.50
IC, 112 sheets	12.80	11.40	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13¼x13¼	....	50.00	55.00
Wiping cloths per M., 13¼x20½	....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.84	1.06	.90
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00

Coke, prompt furnace, Connellsville... per net ton $3.25@$3.50
Coke, prompt foundry, Connellsville... per net ton $4.25@$4.75

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	60–5%	60–10%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	....	65-5%
Lag screws, coach screws	65%	....	65-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50–5%
Bolt ends, with hot pressed nuts	60%	....	55%
Tap bolts, hex. heads	25%	....	.....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.35	$3.25	$3.00
Cone heads, ditto (net)	3.45	3.35	3.10
1¼ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	....	0.15
⅝ in. diameter *EXTRA*	0.15	....	0.15
½ in. diameter *EXTRA*	0.50	....	0.50
1 in. long, and shorter *EXTRA*	0.50	....	0.50
Longer than 5 in *EXTRA*	0.25	....	0.25
Less than 200 lb *EXTRA*	0.50	....	0.50
Countersunk heads *EXTRA*	0.35	......	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	......

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40-10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	....	3.20

NEW and ENLARGED

Machine Tools and Machinery Wanted

Machinery wants published without charge

Machine Tools

Ind., Alexandria—The Zeigler Mfg. Co., manufacturers of metal stampings, etc.—
Ont small straightening roll.
Two squaring shears, 72 in. to 120 in. long.
One No. 6 inclinable geared Bliss press.
One small japanning and enameling outfit.
One spot welder.
One rotary slitting shear, geared.
One large arch screw press for die tryout in toolroom, No. 3 Bliss preferred.
One Universal grinder, 12 in. x 36 in.
One pendulum foot press.
Circle shear No. 14.
Three thread rollers for sheet metal.
Four study threaders.
Four nut tappers.
Two rotary annealing furnaces.
Four rotary washers.
One plain grinder, 6 in. x 32 in.
Five drill presses.
Five small tapping machines.
Two production hardening and heat treating furnaces.
One continuous production rotary millers.

Ind., Evansville—The Faultless Caster Co., Stringtown Rd.—single stroke header.

Ky., Louisville—The Louisville Machine Co., 308 East Main St.—turret lathes and one 24 in. drill press.

Mass., Chelsea—R. T. Green Co., 210 Marginal St.—heavy bending rolls and air compressor of about 500 cu.ft. capacity.

Mass., Worcester—The Matthews Mfg. Co., 104 Gold St.—surface grinder.

Mich., Ann Arbor—The Bd. Regents, University of Michigan—equipment for engineering shops.

Mich., Detroit—Schiffman & Co., 327 East Fort St.—wood turning lathe.

Mo., Joplin—G. S. Davis Studio, 1044 Main St.—drill press and lathe for power machine shop.

Mo., Joplin—The Economy Furniture Co., 916 Main St., W. B. Hunt, Purch. Agt. —power wood lathe.

Mo., Joplin—The Casper County Electric Supply Co., 1412½ Main St., A. Steincoft, Purch. Agt.—air compressor and lathe for power.

Mo., Joplin—J. Doke, 308 East 7th St.—power drill press.

Mo., Joplin—Parmer Bros., 7th and Virginia Aves., C. R. Parmer, Purch. Agt.—power drill press and power lathe for garage machine shop.

Mo., Webb City—J. A. Sorg, North Hall and Daugherty Sts.—power lathe.

Mo., Webb City—The Wilhite Auto Painting & Top Co. North Hall St. and Bway., J. F. Wilhite, Purch. Agt.—drill press, lathe and grinder for power.

Neb., Lincoln—The Pearl Furnace Co., 1023 O St., (sheet metal workers)—J. B. Van Velkinburgh, Purch. Agt.—42 in. pipe mandrel and 30 in. square shears.

N. Y., Buffalo—McKaig-Hatch Co., Skillen St. along the tracks of the New York Central R.R.—drop hammers, machinery and equipment for forge shop.

N. Y., Elmira—The Highway Products & Mfg. Co., 735 Baldwin St.—sheet metal working tools and equipment for the manufacture of corrugated iron culverts, 12 in.-48 in. diameter.

N. Y., Hicksville — Karlson-Lee — Star drilling machine.

N. Y., Lancaster—The Bd. Educ., F. A. Schaefer, Purch. Agt.—wood and metal working tools for manual training classes in high school.

N. Y., Mayville—F. M. Waite—small tools and machinery for garage now under construction.

N. Y., New York—C. R. Bates Co., Inc., 21 Howard St., manufacturer of railroad and shipbuilders supplies—metal cutting tools and drills.

N. Y., North Tonawanda—White & Haskell Co., Main St.—one 14 in. lathe; small drill press; air compressor and tank, for machinery and repair shop.

N. Y., Ogdensburg—The Ogdensburg Water Wks. Dept., D. J. Crichton, Purch. Agt.—power driven pipe threading and tapping machine.

N. Y., Rochester—B. G. Costich, 251 Hayward Ave. — tools, machinery and equipment for repairing gas motors.

N. Y., Rochester—H. Lipshitz, 461 Joseph Ave.—one 16 in. jointer, 16 in. rip saw, wood turning lathe, bore machine and spindle.

N. Y., Watertown—H. Derouin Co., 137 Charles St.—sheet metal working machinery and equipment.

O., Alliance—The Safety Ice Pick Co., 808 East Cambridge St., G. Trumpeter, Genl. Mgr.—general machinery for ice pick factory.

O., Youngstown—The Youngstown Sheet & Tube Co., East Youngstown St., Address Purch. Dept.—machinery for the manufacture of steel plates.

Pa., Pittsburgh—The American Mine Equipment Co., W. D. Stockly, Purch. Agt. —two punch presses, equivalent to the Niagara No. 37 plain press, 2 in. stroke, 3 in. hole for punch shank.

Pa., Pittsburgh—The Edgewater Steel Co., Edgewater Sta., W. A. McKean, Purch. Agt.—one Ridgway type hub facing machine for car wheels, motor driven.

S. C., Lena—H. L. Lawton—one hundred eleven ft. of shafting, 8 4$\frac{7}{16}$ in. collars, 3 bevel gears 24 in. diameter 4$\frac{7}{16}$ in. teeth, 5 flange couplings, 16 pillow boxes.

Vt., Burke—Wiggins Machine & Mfg. Co., Inc., A. V. Wiggins, Pres.—turners and turret equipment for 3 x 36 Jones & Lamson and No. 4 Warner & Swasey turret lathes, (used).

Va., Norfolk—J. B. Porter, P. O. Box 255—tinners squaring shears to cut up to 20 gauge, also tinners cornice brake, (used).

Wis., Manitowoc — The Hamacheck-Bleser Co., 11th and Franklin Sts.—presses and repair equipment for proposed garage and repair shop.

Machinery

Ala., Sheffield—K. Sparks—dredging machinery to dig sand and gravel and deliver same on barges, including chain, bucket, dredge with 5 to 7 cu.ft. bucket and about 60 ft. ladder.

Conn., Ansonia—The Jayne Garage, 163 Wakelee Ave.—one ton chain hoist.

Conn., Bridgeport—R. H. Gorham, R. F. D. 3—one ton chain hoist for farm.

Ia., Des Moines—The Bd. Educ., G. L. Garton, Secy.—manual training shops and machinery for Theodore Roosevelt High School.

Ill., Pontiac—The Allen Candy Co.—ice machinery for proposed ice plant.

Ind., East Chicago—The Green Eng. Co., Kennedy St.—belt driven air compressor of 300-450 cu.ft. capacity to operate on 80-100 lb. pressure, (used).

Kan., Pittsburg—The Pittsburg Candy Co., 1211 North Bway.—machinery for making candy.

Ky., Sturgis—W. Herbert—complete line of coal mining machinery, including hoists, conveyors, washing machinery, mine and power plant equipment.

Mass., Fall River—Fyans, Fraser & Blackway Co., 83 Anawan St.—dyeing machine for cotton goods, (continuous).

Me., East Wilton (Wilton P. O.)—Gledhill Woolen Co.—2 jack winder machines.

Mich., Detroit—A. W. Fellers, 6035 14th Ave.—woodworking equipment including matcher and finishing machine.

Mich., St. Clair—The Diamond Crystal Salt Co., F. Moore, Mgr.—equipment for proposed plant at Courtright, to have capacity of 700 bbl. daily.

Mo., Joplin—The Joplin Marble Wks., 1047 Main St., W. D. Northern, Purch. Agt. —automatic drilling machinery and power hammers.

Mo., Joplin—The Monarch Garage, 410 Penna Ave., R. A. Nicely, Purch. Agt.—leather working machinery for automobile upholstery department.

Mo., Joplin—Walkers Planing Mill, 1305 Joplin St., H. H. Walker, Purch. Agt.—woodworking machinery for the manufacture of wooden boxes.

Mo., Joplin—The Ward Optical Co., 530 Main St., W. E. Ward, Purch. Agt.—power optical grinder.

Mo., Springfield—The Saint Louis—San Francisco R. R., B. T. Wood, Vice-Pres. and Ch. Purch. Officer—$200,000 worth of machinery for repair shops here.

Mo., St. Louis—L. Litch, 2927 South 13th St.—printing press.

Mo., St. Louis—D. O. O'Leary, 2600 Bellegrade St.—woodworking machinery.

Mo., St. Louis—G. Stein, 1229½ Chauteau St.—printing press.

Mo., Webb City—Denny-Maier Upholstering Co., 210 North Main St.—planer, wood lathe for furniture repairing also woodworking machinery.

Neb., Lincoln—The Lincoln Storage Battery Co., 1425 N St., R. C. Fields, Mgr.—grid moulds for 5⅛ in. x 4⅛ in. x ⅛ in. and for 5⅛ in. x 4⅛ in. x ⅛ in. battery grids, both for straight lug grids.

Neb., Lincoln—The Port Huron Mchy. Co., 817 R St., tractor supply house, W. J. Edwards, Purch. Agt.—power hack saw and 2 hp. electric motor, (used).

Neb., Lincoln—The Ziegler Battery Co., 1609 N St., G. Ziegler, Purch. Agt.—will install electrical department for repair of automobile generators and starting motors, and is in the market for repair parts and replacement material.

N. Y., Avon—The Avon Knitting Co., Inc., C. T. Davis, Secy.—machinery for the manufacture of knit goods.

N. Y., Binghamton—J. H. Carver Co., Inc., 72 State St., J. H. Carver, Purch. Agt.—flat four wheel industrial trucks and one large size paper baler.

N. Y., Brooklyn—The Natl. Fdry. Co., 10 Sandford St.—electric arc welding outfit with 7½ hp., d.c. motor and generator.

N. Y., Buffalo—The Richardson & Boynton Co., Kensington Ave.—foundry machinery and equipment.

N. Y., Dexter—The Dexter Sulphite Pulp & Paper Co., C. Campbell, Purch. Agt.—paper cutting and slitting machinery.

N. Y., Friendship—F. J. Moser—compressor, small 2 stage, capacity 25 to 50 ft. per min., pressure 250 lbs.

N. Y., Geneva—W. L. Packard, 780 South Main St.—one No. 5 magazine for printing job work office.

N. Y., Hammand—The J. R. Scanlon Co., Main and Depot Sts., J. R. Scanlon, Purch. Agt.—one portable forge and blower; battery charging outfit and panel.

N. Y., Harrisville—The Diana Paper Co.—paper cutting and slitting machinery.

N. Y., Long Island City—The Cornellist Textile Corp., 45 Jamaica Ave.—tentering machine, (used).

N. Y., New York—The Gloria Knitting Mills, Inc., 27 East 21st St.—several 8 in. Brinton knit machines and ribbing machines.

N. Y., New York—The Hammond Typewriter Co., 537 East 69th St.—locomotive crane, 40-50 ft. boom, with electric or gasoline hoist.

N. Y., New York—The International Paper Co., 30 Broad St.—paper cutting and slitting machinery.

N. Y., New York—Neemes Bros., Inc., 206-18 1st St., R. R. Rees, Purch. Agt.—air chippers for chipping cast iron castings; 3 or 5 ton jib crane; cupalo bottom for 60 in. shell; air compressor of about 175 cu.ft.

N. Y., Norfolk—The Hanna Paper Corp., W. Simons, Purch. Agt.—paper cutting and slitting machinery.

N. Y., Port Gibson—H. R. Ericson—small or medium sized printing press.

N. Y., Potsdam—The Racquette River Paper Co., R. E. Sisson, Purch. Agt.—paper cutting and slitting machinery for kraft paper.

N. Y., Rochester—A. W. Hopeman & Sons Co., Lyell Ave.—machinery for furniture plant now in course of construction.

N. Y., Silver Creek—J. U. Hammond—machinery for bottling beverages and roasting coffee, for proposed factory in Jamestown.

N. Y., Utica—The Boonville Sand Corp., H. V. Owens, Purch. Agt.—sand and gravel conveying, screening and grading equipment.

N. C., Burlington—T. J. Horner—machinery and outfit for the manufacture of mattresses, (used).

N. C., Mebane—Crawford & Crawford, J. Crawford, Purch. Agt.—wood veneering machinery, (new or used).

N. C., Salisbury—J. T. Wyatt, Box 10, manufacturer of paint—paint grinding mill, (used).

O., Cleveland—The Cleveland Graphite Bronze Co., 2906 Chester Ave.—one 6 x 6 air compressor.

O., Youngstown—The Lake Erie Limestone Co., 906 Wick Bldg.—one conveyor about 130 ft. long, 30 in. belt, and one rotary screen.

Pa., Franklin—G. E. Glines and F. A. Howard—$10,000 worth of refrigeration machinery for proposed milk plant on 10th St.

Pa., Norristown—The Amer. Asbestos Co., Strgr. and Stnbrdg.—heavy belting looms for making solid woven belting from 3-10 in. and about ⅜-⅝ in. thickness.

Pa., Phila.—The Chesterman Leeland Co., 902 Montgomery St.—small finishing machine for elastic webbing making.

Pa., Phila.—Wertz & Volk, c/o D. D. Wertz, Archt., Real Estate Trust Bldg.—steam kettles, conveyors, etc., for slaughter house.

Pa., Pittsburgh—The Amer. Sheet & Tin Plate Co., Frick Bldg., M. S. Dennis, Purch. Agt.—jib crane and traveling crane.

Pa., Pittsburgh — The Pittsburgh Des Moines Steel Co.—10 ton, 3 motor crane, 23 ft. 9 in. span.

S. C., Greenwood—M. C. Marshall—complete line of canning machinery and equipment for canning fruits and vegetables.

Va., Norfolk—E. B. Murchant, Genl. Delivery—combination woodworking machinery, (used).

Va., Roanoke—G. Dinguid, 824 13th St.—complete line of machinery for the manufacture of brooms.

Va., Waverly—The Natl. Peanuts Product Co., C. E. Reick, Mgr.—peanut butter mill and miscellaneous candy manufacturing machinery, (new or used).

Va., Winchester—The Winchester Lumber Corp., W. B. Cornwell, Genl. Mgr.—machinery for the manufacture of hard wood flooring, (used).

Wis., Blair—The Blair Canning Co., A. J. Boe, Purch. Agt.—hullers, viners, sorters, operated by line shaft, for vegetable canning plant.

Wis., Eden—The Empire Dairy Co., c/o B. McCrory, Route 1—creamery machinery including separators, churns and testers.

Wis., Holmen—The Holmen Creamery Assn., V. Keppel, Mgr.—modern butter making machinery, shafting, belting, etc., for proposed creamery.

Wis., Milwaukee—The Ideal Dairy Co., c/o G. R. Weiland, 415 32nd Ave.—dairy products machinery, separators, churns and print machines, steam power driven.

Wis., Milwaukee—J. Merkowski, 926 16th Ave.—portable saw mill to saw logs about 18 in. in diameter.

Wis., Milwaukee—The Monarch Mfg. Co., 70 Chicago St., manufacturers of overalls, clothing, etc., S. Brochman, Purch. Agt.—power stitching and stamping machines.

Wis., Milwaukee—R. Tubesing, 852 6th St.—gas storage tank and pump.

Wis., New London—Hamilton & Sons Co., E. Hamilton, Pres.—canning machinery and conveying machinery for proposed cannery.

Wis., Stevens Point—The Pfiffer Lumber Co., 229 Franklin St.—electric motors, woodworking machinery, planers, lathes, etc.

Ont., Dundas—The Thornton Blanket & Woolen Co., R. R. No. 1.—woolen weaving and picking machinery.

Ont., Galt—The Riverside Silk Mills, River St.—special machinery and equipment for the manufacture of silk.

Ont., Guelph—The Dominion Linens, Ltd., D. M. Sanson, Pres.—additional machinery and equipment. Estimated cost, $40,000.

Ont., London—The Pure Gasoline Co., 362 Dundas St., J. Factor, Mgr.—gasoline and lubrication equipment for proposed gasoline stations.

Ont., London—T. Terry, 150 Fullerton St.—machine shop equipment.

Ont., Port Stanley—The London Port Stanley Ry., London—$35,000 worth of electrically operated dmachinery including, buckets, derrick and operated machinery for coal handling depot.

Ont., St. Mary's—The Hurlbut Shoe Co., C. E. Hurlbut, Mgr.—special shoe machinery and equipmemnt. Estimated cost, $30,000.

Ont., Toronto—The Orange Crush Bottlers, Ltd., 100 Claremont St.—equipment for branch bottling plants at London and Windsor. Estimated cost, $30,000.

Metal Working Shops

Cal., Oakland—C. A. Hancock, c/o H. J. Christensen, Federal Bldg., has awarded the contract for the construction of a 1 story garage on 23rd and Valdez Sts. Estimated cost, $40,000.

Cal., Oakland—The Universal Products Co., Thayer Bldg., has had sketches made for the construction of a factory for the manufacture of household products. Estimated cost, $100,000. F. H. Horswill, Thayer Bldg., Archt.

Cal., San Francisco—D. A. Reidy, Archt., Pacific Bldg., is receiving bids for the construction of a 1 story factory on Bryant and Sterling Sts., for the Magnolia Metal Co., Pacific Bldg. Estimated cost, $12,000.

Cal., San Francisco—The United Garage Co., c/o O'Brien Bros., Inc., Archts., 240 Montgomery St., is having plans prepared for the construction of a 5 story commercial garage on Ellis St. near Mason St. Estimated cost $165,000.

Cal., San Jose—N. Kooser, 446 South 2nd St., has awarded the contract for the construction of a 2 story garage on River and Santa Clara Sts. Estimated cost, $40,000. Hayes & Canelo, lessees.

Conn., Stamford—The Victor-Page Motor Corp., Farmingdale, N. Y., has awarded the contract for the construction of a 1 story, 60 x 200 ft. factory, (1st unit) on Melrose Ave., here. Estimated cost, $40,000.

D. C., Wash.—W. W. Biggs, 1310 14th St., N.W., has awarded the contract for the construction of a garage. Estimated cost, $85,000.

Ill., Dixon—E. R. Watts has awarded the contract for the construction of a 1 story, 54 x 150 ft. garage. Estimated cost, $40,000. Noted March 30.

Ill., Joliet—The Reo Joliet Sales & Service Co., 121 South Bluff St., will soon award the contract for the construction of a 1 story, 50 x 124 ft. garage. Estimated cost, $42,000. Private plans.

Mass., Charlestown—D. J. Kane, 73 Tremont St., Boston, has awarded the contract for the construction of a 2 story, 103 x 120 ft. garage on Warren St. Estimated cost, $60,000.

Mass., Springfield—The U. S. Spring Bed Co., 228 Birnie Ave., has awarded the contract for the construction of a 1 and 2 story, 70 x 100 ft. and 50 x 100 ft. addition to its plant. Estimated cost, $40,000.

Mich., Ann Arbor—The Bd. Regents, University of Michigan, will soon award the contract for the construction of a 4 story, 189 x 248 ft. engineering building, shops and laboratory, on East University Ave. Smith, Hinchman & Grylls, 710 Washington Arcade, Detroit, Engrs. Noted Dec. 15.

Mich., Detroit—M. Zack, 121 Josephine St., is having plans prepared for the construction of a 1 story, 22 x 60 x 86 ft. machine shop and garage on Holbrook St. Estimated cost, $20,000. J. Weinberg, 401 Congress Bldg., Archt.

Mo., Jefferson City — The Automatic Water Pump Mfg. Co., 236 East High St., will build six or seven 1 story factory buildings. Estimated cost, $100,000. Noted March 30.

Mo., St. Louis—The Johnson Automobile Co., 3667 Olive St., will soon award the contract for the construction of a 2 story, 50 x 52 ft. garage on Olive St. Estimated cost, $45,000. W. L. Johnson, Pres. W. P. McMahon, Title Guaranty Bldg., Archts. Noted March 30.

N. Y., Buffalo—E. R. Emig, 871 East Ferry St., plans to build a machine shop on East Ferry St. Estimated cost, $10,000. Architect not selected.

N. Y., Buffalo—The New York Central R.R., Grand Central Terminal, New York, plans to build a forge shop here. Estimated cost, $12,000. McKaig Hatch Co., 1584 Niagara St., Archts.

N. Y., Buffalo—The Stearns Electric Equipment Co., 66 Bway., plans to build an addition to its shop. Estimated cost, $12,000. Architect not announced.

N. Y., Falconer—C. J. Wilcox, Ashville, plans to build a 2 story, 50 x 130 ft. factory on East Main St., here. Estimated cost, $10,000. Architect not announced. Progressive Machine Co., lessee.

N. Y., New York—The Prudential Iron Co., 633 Concord Ave., plans to construct a plant and office building on 140th St. adjoining the New York, New Haven & Hartford R.R. tracks. Estimated cost, $150,000. Architect not selected.

O., Willoughby—L. Martin & Sons, Curtland, (Willoughby P. O.), are having plans prepared for the construction of a 1 story, 65 x 82 ft. garage here. Estimated cost, $40,000. Private plans.

Pa., Greenville—The DuRoth Steel Truck & Car Wheel Co. plans to build a factory on Osgood St., here. Architect not selected.

Pa., Phila.—W. L. Charr, Archt., 149 South 4th St., is receiving bids for the construction of a 1 story, 70 x 150 ft. garage on Frankford and Clementine Aves., for A. Salot, 3133 Frankford Ave. Estimated cost, $90,000.

Pa., Phila.—R. W. Pollock, Archt., 1802 Chestnut St., will receive bids until May 1 for the construction of a 2 story, 46 x 52 ft. sales and service station at 1155-57 South Broad St., for J. A. Cunningham. Estimated cost, $80,000.

Tex., Beaumont—The Brooks Supply Co., 799 Franklin St., plans to enlarge its machine shops.

Utah, Salt Lake City—The Utah Steel Corp., Boston Bldg., plans to build 1 story blast furnaces, near here. Estimated cost, $500,000. A. J. McKeen Co., 2422 Euclid Ave., Cleveland, O., Engrs.

Wis., Manitowoc—Hamacheck-Bleser Co., (owner), 11th and Franklin Sts. and Smith & Reynolds, archts., Dempsey Bldg., archts., will receive bids until April 29, for the construction of a 1 story, 50 x 139 ft. garage and repair shop. Estimated cost, $50,000.

Wis., Milwaukee—R. Tubesing, 852 6th St., has awarded the contract for the construction of a 2 story, 32 x 120 ft. garage on Fond du Lac Ave. Estimated cost, $40,000.

Ont., London—The Pure Gasoline Co., 362 Dundas St., will build and equip 15 modern gasoline stations. Estimated cost, $150,000. J. Factor, Mgr.

Ont., London—T. Terry, 150 Fullerton St., will soon award the contract for the construction of a 1 story, 50 x 200 ft. garage and machine shop. Estimated cost, $25,000. Private plans.

Ont., Ottawa—The Beach Motors, Ltd., 186 Albert St., will build a 2 story, 133 x 200 ft. garage on Bank St. Estimated cost, $100,000.

H. T., Pearl Harbor—The Bureau of Yards and Docks, Navy Dept., Wash., D. C., will receive bids until June 7 for the completion of a machine shop here.

General Manufacturing

Cal., Hayward—P. Verzic is having plans prepared for the construction of a 1 story bakery on Castro St. between A and B Sts. Estimated cost, $20,000. Sorenson Bros., 1110 C St., Archt.

Cal., San Francisco — The Gragnano Products Co., Inc., 823 Valencia St., is having plans prepared for the construction of a 2 story paste factory on 20th St. and Potrero Ave. Estimated cost, $20,000. A. J. Horstman, Anglo Bldg., 16th and Mission Sts., Archt.

Cal., San Francisco — The Natl. Ice Cream Co., 371 Guerrero St., has had plans prepared for the construction of a 2 story warehouse and packing plant on Guerrero St. near 16th St. Estimated cost, $26,000. W. Mooser, Nevada Bank Bldg., Archt.

Cal., San Francisco—The Southern Pacific Co., S. P. Bldg., and the Pacific Fruit Express Co., 65 Market St., are having plans prepared for the construction of an ice and loading plant on Bakersfield St. Estimated cost, $400,000. W. C. Phillips Co., 311 California St., Engrs.

Cal., San Luis Obispo—G. Jacobs has awarded the contract for the construction of a 2 story bakery. Estimated cost, $19,000.

Cal., San Rafael—The San Rafael Ice Co. plans to build a 50 x 100 ft. ice plant, to have capacity of 15 ton per day. Estimated cost, $50,000. E. P. Grady, Pres. Architect not selected.

Fla., Orlando—The Orlando Water & Light Co. plans to increase capacity of gas plant from 300,000 to 1,000,000 ft. per day. Estimated cost, $75,000.

Ill., Chicago—A. S. Ahlschuler, Archt., 28 East Jackson Blvd., will soon receive bids for the construction of a 6 story, 170 x 177 ft. printing plant on Prairie Ave. and 20th St., for the Atwell Printing & Binding Co., Sherman and Polk Sts. Estimated cost, $700,000. Noted Jan. 12.

Ill., Chicago — The Paasche Air Brush Co. 1219 West Washington St., has awarded the contract for the construction of a 2 story, 150 x 150 ft. factory at 1909-15 Diversey Parkway. Estimated cost, $75,000. Noted March 30.

Ill., Clinton—The Puritan Products Co. plans to build a 2 story, 66 x 132 ft. dairy and creamery. Estimated cost, $50,000. Architect not selected.

Ill., East St. Louis—The Highland Ice Cream Co. will build a 1 story, 45 x 105 ft., 57 x 58 ft. and 26 x 30 ft. ice cream plant on St. Clair St. Estimated cost, $75,000.

Ill., Pontiac—The Allen Candy Co. plans to build a 1 story ice plant. Estimated cost, $25,000. Architect not selected.

Ind., Hammond—M. R. Carpenter, Archt., 105 North Clark St., Chicago, will soon receive bids for the construction of a 1 story, 90 x 151 ft. ice cream factory for the Consumers Ice Co., c/o architect. Estimated cost, $50,000.

Kan., Pittsburg—The Pittsburg Candy Co. plans to build a 2 story candy factory at 1211 North Bway. Estimated cost, $20,000.

Ky., Louisville—The Kentucky & Indiana Dairies Co., 500 Fehr Ave., plans to construct a creamery building on Fehr Ave. Estimated cost, $6,000. Architect not announced.

Mass., Clinton — The Bigelow Hartford Carpet Co., 58 Main St., Thompsonville, Conn., is having plans prepared for the construction of a 1 story dyehouse, etc. Private plans.

Mass., Lawrence—Walworth Bros. Inc., Merrimack St., has awarded the contract for the construction of a 3 story, 50 x 130 ft. addition to its textile mill. Estimated cost, $60,000.

Mass., North Dighton—The Mt. Hope Finishing Co. will soon award the contract for the construction of a 1 story, 115 x 300 ft. main building; 1 story, 50 x 150 ft. soap house; 1 story, 40 x 155 ft. dairy; 1 story, 50 x 150 ft. chemical laboratory and four 1 story steel storehouses. Private plans.

Mass., Southboro—The Dennison Mfg. Co., Framingham, has awarded the contract for the construction of a 4 story, 68 x 290 ft. plant, here, for the manufacture of tags, etc. Estimated cost, $400,000.

Mass., Springfield—The Bakery Finance Corp. (Grocers Bead Co., owner), Dexter Bldg., has awarded the contract for the construction of a 2 story bakery. Estimated cost, $150,000.

Mass., Springfield — The Springfield Blower Co., 89 Morris St., plans to build a 1 and 2 story plant (blower systems), on Ashley St. Architect not selected.

Mo., Hannibal—The Bluff City Shoe Co., c/o W. A. Meyer, Pres., has awarded the contract for the construction of a 2 story factory at 1201 Collier St. Estimated cost, $25,000. Noted March 2.

Mo., Jefferson City—The Strawboard Mfg. Co. is having plans prepared for the construction of a 2 story, 60 x 150 ft. strawboard factory. Estimated cost, $36,000. Private plans.

Mo., St. Louis—The American Syrup & Preserving Co., Ruskin Ave., will build a 2 story, 60 x 255 ft. warehouse and factory on Penrose Ave. Estimated cost, $25,000. Noted March 30.

Minn., St. Paul—The Daily News Publishing Co., 94 East 4th St., has awarded the contract for the construction of a 3 story, 100 x 150 ft. newspaper plant, etc., on 4th St. between Cedar and Minnesota Sts. Estimated cost, $100,000. Noted Feb. 16.

Mo., St. Louis—J. O. Chenoweth Dyeing & Cleaning Co., 1400 Washington St., will soon award the contract for the construction of a 2 story, 119 x 160 ft. dyeing and cleaning establishment on Delmar Blvd. and Bayard Ave. Estimated cost, $50,000. A. B. Groves, 314 North 4th St., Archt. Noted Dec. 15.

N. J., Camden—J. B. Van Scriver Co. has awarded the contract for the construction of a 7 story, 57 x 61 x 199 x 220 ft. factory on Federal St., for the manufacture of furniture. Estimated cost, $600,000. Noted Feb. 23.

N. J., Trenton—C. V. Hill & Co., 360 Pennington Ave., will build a 2 story, 48 x 190 ft. addition to its refrigerator works. Estimated cost, $25,000.

N. Y., Albany—The Oneida County Creameries Co., Inc., Paul Bldg., Utica, has awarded the contract for the construction of a milk plant on Tivoli St., here. Estimated cost, $40,000. Address S. J. Norton, 432 2nd Ave., Albany, Mgr.

N. Y., Batavia—The Gypsolite Co., Inc., has purchased a site on Harvester Ave., and plans to build a 1 story, 60 x 400 ft. factory. Estimated cost between $75,000 and $100,000. Address J. F. Haggerty, Pres., 66 Bedford Ave., Buffalo.

N. Y., Buffalo—E. T. Danahy, 602 Babcock St., plans to build a packing plant, office and garage on Babcock St. Estimated cost, $46,000.

N. Y., Little Falls—The Barnet Leather Co., 81 Fulton St., New York City, will soon award the contract for the construction of a factory here. Estimated cost, $100,000. Thomas & Binger, 280 Madison Ave., New York City, Archts and Engrs.

N. Y., Naples—The New York Pea Packers Inc., has awarded the contract for the construction of a cannery, including a 1 story, 40 x 110 ft. main building, a 1 story, 72 x 95 ft. vinery shift and a 1 story, 20 x 30 ft. office building.

N. Y., New York—The New York Tribune, Inc., 154 Nassau St., will soon receive bids for the construction of a 7 story printing plant and office building at 219-29 West 40th St. Estimated cost, $500,000. Lockwood, Greene & Co., 101 Park Ave., Archts. and Engrs.

N. Y., Rochester—The Rochester Printing Co. plans to build an addition to its printing plant at 59-63 Main St. Estimated cost, $50,000.

O., Cleveland—The Hough Ave. Home Bakery, 8708 Hough Ave., has awarded the contract for the construction of a 1 story, 51 x 114 ft. bakery and commercial building, on Hough Ave. Estimated cost, $40,000.

O., Kenmore—The Palmer Match Co., Akron, is receiving bids for the construction of the 1st unit of its match factory here. 2 story, 82 x 225 ft. Estimated cost, $50,000. Ultimate cost, $700,000. Noted Aug. 4.

O., Youngstown—The Lake Erie Limestone Co., 906 Wick Bldg., is receiving bids for the construction of a 3 story, 34 x 34 ft. screen house. Estimated cost, $10,000. Private plans.

Pa., Franklin—G. E. Glines, F. A. Howard, and other business men of Franklin, plan to build a milk plant on 10th St. Estimated cost, $25,000. Architect not announced.

Pa., Phila.—Wertz & Volk, c/o D. D. Wertz, Archt., Real Estate Trust Bldg., has awarded the contract for the construction of a 1 story, 62 x 70 ft. slaughter house at 2838-44 North 28th St. Estimated cost, $25,000.

Pa., Phoenixville—The Weiland Packing Co., 551 West Bridge St., is receiving bids for the construction of a 3 story, 53 x 62 ft. sausage factory. Estimated cost, $60,000. T. A. Stoutenberg, 1509 Champlost Ave., Phila., Engr.

Pa., Pittsburgh—H. J. Heinz Co., 1062 Progress St., will soon award the contract for the construction of a 6 story, 92 x 150 ft. spaghetti factory. Estimated cost, $150,000. S. A. Hall, c/o owner, Archt.

Wis., Holmen—The Holmen Creamery Assn. will receive bids until April 24 for the construction of a 2 story, 70 x 72 ft. creamery. Estimated cost, $35,000. V. Keppel, Mgr. Private plans.

Wis., New London—Hamilton & Sons Canning Co. plans to build a 2 story addition to its canning plant. E. Hamilton, Pres. Private plans.

Wis., Stevens Point—Pfiffer Lumber Co., 229 Franklin St., will build a 2 story, 60 x 100 ft. planing mill on Franklin St. Estimated cost, $48,000.

Ont., Courtright—The Diamond Crystal Salt Co., St. Clair, Mich., is having plans prepared for the construction of a salt refining plant with a capacity of 700 bbl. daily. Estimated cost, $60,000. F. Moore, Mgr.

Ont., Dundas—The Thornton Blanket & Woolen Co., R. R. No. 1, plans to build a 2 story, 60 x 84 ft. blanket factory. Estimated cost, $18,000. Architect not selected.

Ont., Galt—The Riverside Silk Mills has awarded the contract for the construction of a 3 story, 50 x 100 ft. addition to its factory on River St. Estimated cost, $100,000.

Ont., Ottawa—The Ottawa Dairy Ltd., 393 Somerset St., W., plans to alter and build additions to its dairy. Estimated cost, $75,000. J. Bingham, Mgr.

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American Machinist

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Economic Aspects of Standardization—E. F. DuBrul

Methods of Machine Tool Design—A. L. DeLeeuw

Strength and Proportions of Industrial Gears—G. E. Katzenmeyer

The articles listed above are to appear in the next issue.

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October 28th, 1921.

Mr. Mason Britton, Gen. Mgr.,
American Machinist,
10th Ave. & 36th St.,
New York City, New York.

Dear Sir:

On this anniversary of the birth of the American Machinist, we wish to congratulate you upon the wonderful work that it is doing. We have advertised prominently in this publication for over thirty years and must attribute to it more than any other publication, the wide publicity which our Remanufacturing business has attained. While general business throughout the country is dull, we receive a great many inquiries, a large part of which we can trace to the American Machinist. Although this has been a year of retrenchment in most of our advertising, we have made no change in the space which we use in your journal and we hope to occupy a prominent place in the American Machinist for another thirty years.

With best wishes for the future and with kindest personal regards to yourself, we beg to remain,

Yours very truly,

HILL, CLARKE & CO. OF CHICAGO

A W Wigglesworth.

President

AWW-S

American Machinist

Volume 56 NEW YORK, APRIL 27, 1922 Number 17

Special Tools and Fixtures in a Southern Railroad Shop

Chuck for Holding Driving Boxes—An Expansion Mandrel—Fixture for Squaring Rod Brasses—A Multiple Toolholder—Chuck for Turning Packing Rings

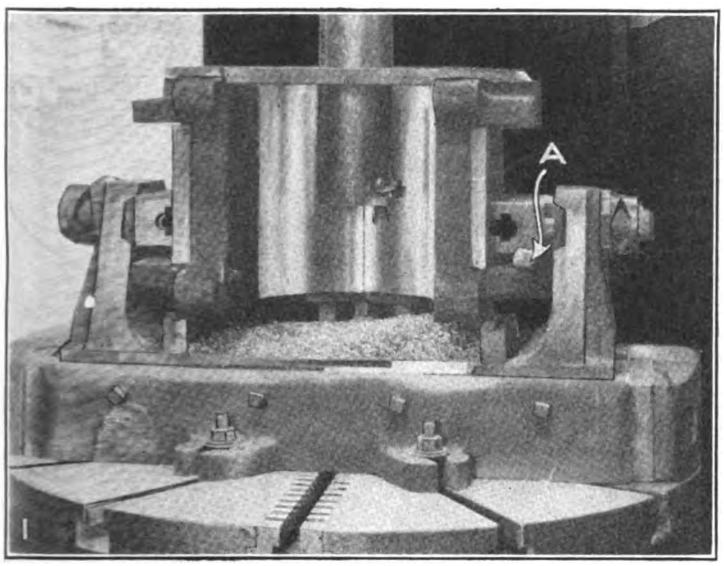
By S. ASHTON HAND
Associate Editor, American Machinist

WHILE railroad repair shops have not been noted for progress in the use of special tools and fixtures for getting out repair parts for locomotives, a visit to some of the shops in the South has shown that their executives are fully alive to the advantages of tooling up for the work.

The tools and fixtures described and illustrated in this article are in use in the 17th St. shops of the Chesapeake & Ohio Railway, Richmond, Virginia.

Driving boxes are clumsy things to handle on the boring mill with no other holding arrangements besides the ordinary bolts, clamps and parallels. In Fig. 1 is shown a driving box mounted in a chuck on a boring mill. The chuck is a modification and enlargement of the two-jawed box chuck so well known to brass finishers and the wonder is that it was not adapted to heavy work long ago. However, it remained for F. B. Moss, assistant master mechanic of the Fulton Shops, East Richmond freight terminal, to develop the chuck in its present form. False jaws to accommodate work of almost any shape can be readily attached to the permanent jaws, thus adapting it to a variety of work. The driving box shown in the chuck rests on parallels and is forced down on them by wedges driven between the chuck jaws and the lower flanges of the box, as at *A*. The wedge on the opposite side of the box is driven in from the back and so is not visible in the illustration.

In some driving boxes in use on the locomotives of this road the crown brasses are made in two parts and spread by a wedge at the top of the crown to hold them tightly in place. Such a driving box is shown in the halftone, Fig. 2, and in detail in the line drawing, Fig. 3. No matter how tightly crown brasses are forced into driving boxes nor how well pinned in place, they will work loose in time can and be tightened only by putting in shims and new pins—a job that necessitates the removal of the boxes from the frames. In boxes such as shown in Figs. 2 and 3 the crown brasses can be tightened at any time on the road by drawing in the wedge.



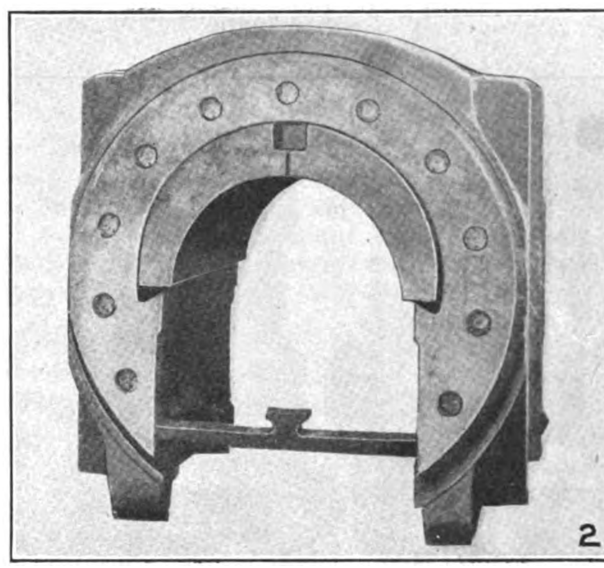


FIG. 1. CHUCK FOR HOLDING DRIVING BOXES. FIG. 2. DRIVING BOX WITH TWO-PART CROWN BRASS

A smaller chuck of the Moss type, arranged for boring rod brasses, is shown in Fig. 4. False jaws in the form of V-blocks are used to hold the work and it will be noted that they are so mounted as to permit adjustment at a right-angle to the gripping axis of the chuck. Ability to shift the work in two directions makes the truing up an easy matter.

An expanding mandrel operated by a three-lobed cam in connection with rollers is shown in Fig. 5. The cam *A*, with lobes in the form of ratchet teeth, is an integral part of the mandrel body. The rollers *B* are mounted on arms pivotally attached to the plates *C* and *D*, which

are free to revolve within certain limits about the cam *A*, and it will be readily understood that motion in one direction or the other will cause the rollers to approach

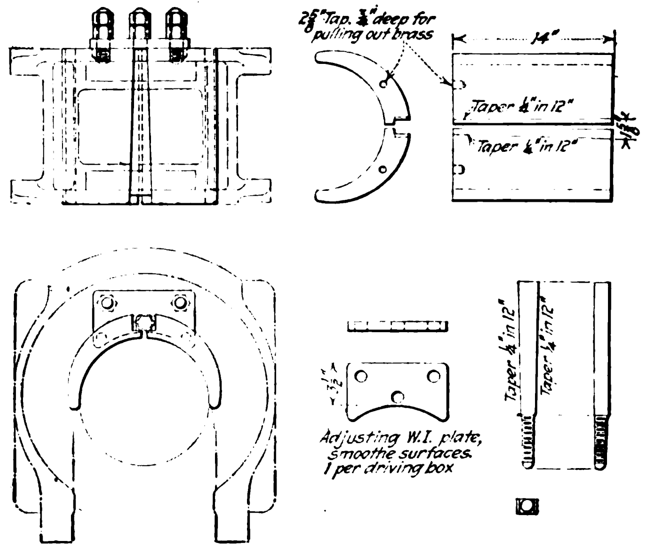


FIG. 3. DETAILS OF DRIVING BOX, CROWN BRASS AND WEDGE

or recede from the center. The rollers are normally kept opposite the high points of the cam lobes by a spring in the lower plate *D* tending to revolve it around the cam, the motion being limited by a stop pin. To use the chuck, lower plate *D* is revolved so that the rollers are opposite the low points of the cam lobes and then locked by turning the handle *E*, when the work can be put in place. Turning the handle *E* in the opposite direction allows the spring to revolve the plates and

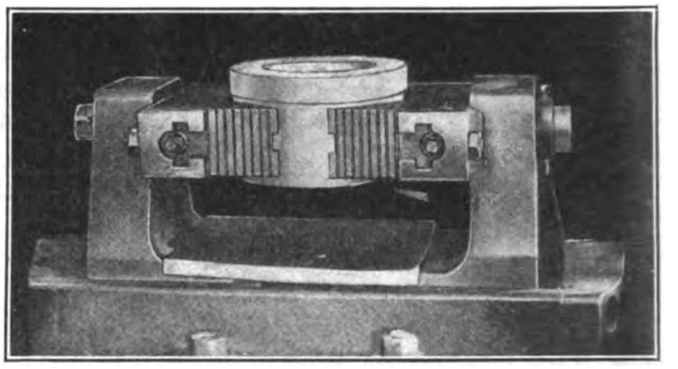


FIG. 4. SMALL MOSS CHUCK WITH V-JAWS

move the rollers along the inclines of the cam until they grip the interior of the work. Any tendency to revolve the work by the pressure of the cut will further expand the rollers and tighten their grip. For various sizes of work, split shells such as shown at *G* and *H* are provided. The collars *I* and *K* are used to position short

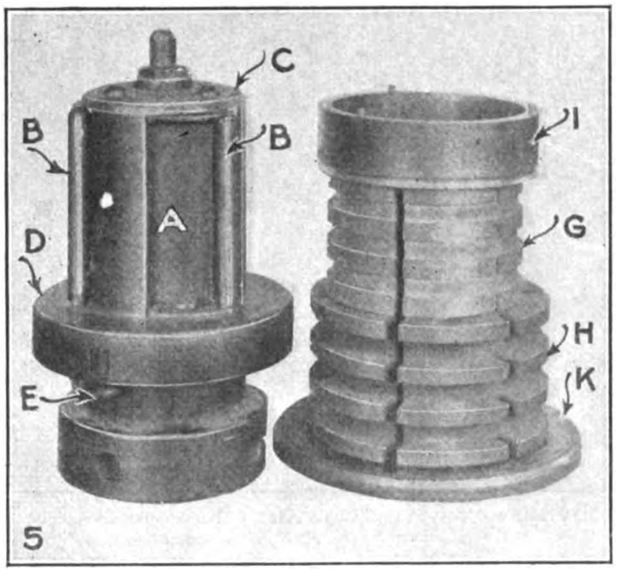


FIG. 5. A ROLLER-TYPE EXPANSION MANDREL.

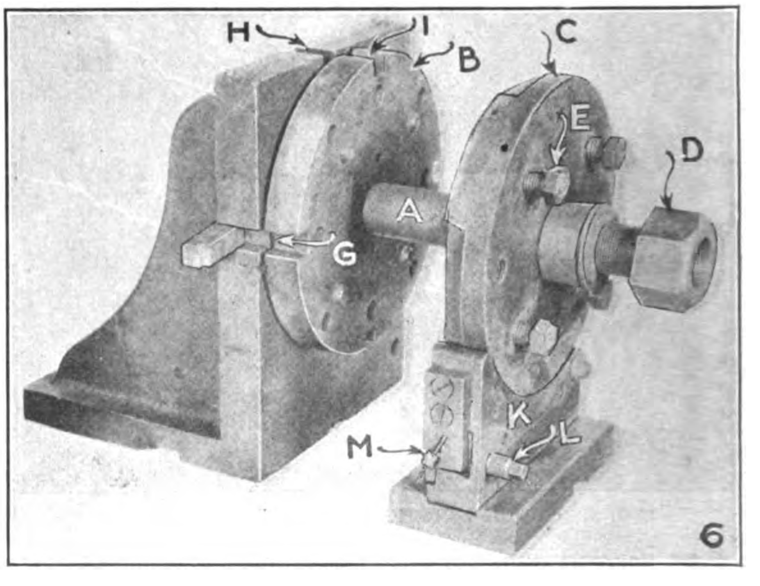


FIG. 6. FIXTURE FOR SQUARING ROD BRASSES

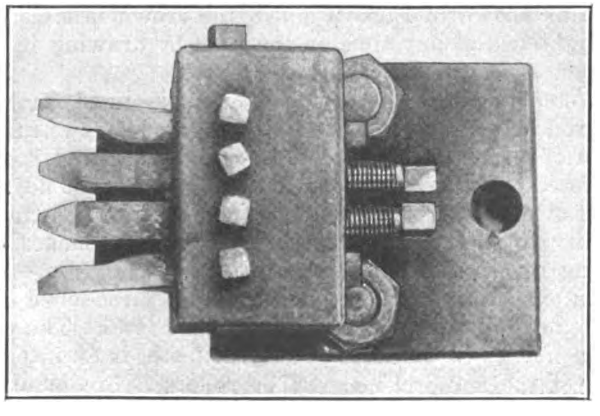


FIG. 7. TOOLS FOR SQUARING ROD BRASSES.

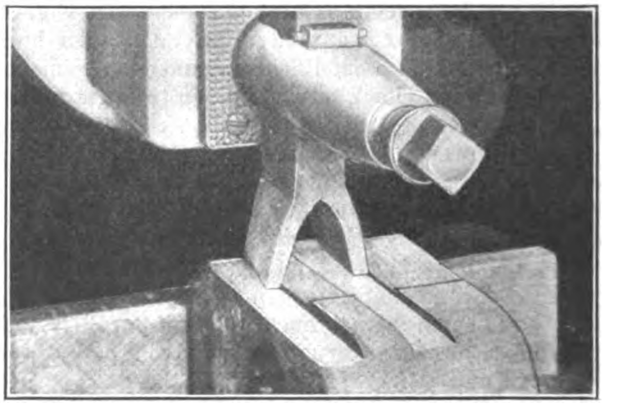


FIG. 8. SPLAYED TOOL FOR SHAPING BRASSES

work on the mandrel to allow facing the outer end. The mandrel can be attached either to the nose of a lathe spindle or to the threaded end of a base for mounting on the table of a boring mill.

Squaring Connecting-Rod Brasses

Flanged brasses for the crankpin ends of connecting rods are squared in a slotting machine and are held in the fixture shown in Fig. 6. The brass, either in one piece or in two pieces soldered together, is mounted on a bushing on the central arbor *A* and clamped between the cupped points of screws in plates *B* and *C*, by means of the nut *D*. Slippage under pressure of the cut is taken care of by tightening the screws *E*, in the outer plate, their cupped points and those of the screws in the inner plate biting into the softer metal of the work. Notches and latches are arranged as at *G* for indexing the work. It will be noted that the upper notches *H* and *I* do not match. This difference is made so that when the side latches are disengaged from their notches and a latch at the top engaged with notches *H* and *I*, the work will be thrown out of square to allow one side to be machined at an angle to fit the tapered adjusting key in the rod. This adjustment is made only when machining brasses without flanges to be fitted into rods machined from the solid and not provided with straps.

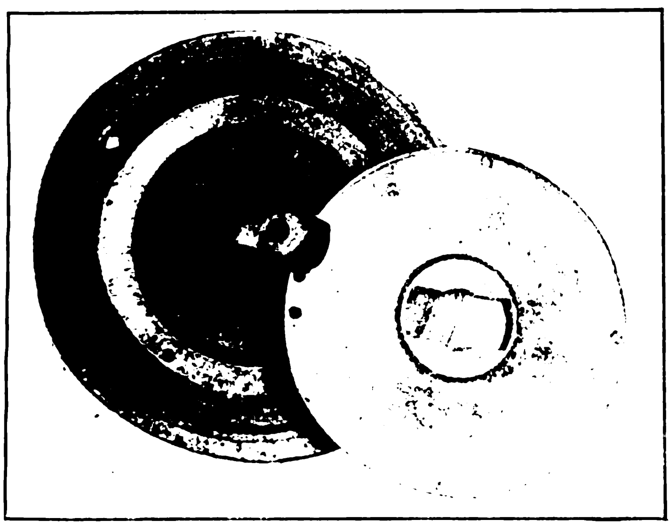


FIG. 9. CHUCK FOR TURNING AND FACING PACKING RINGS

The fixture is provided with an adjustable outboard support *K* to prevent springing under the downward thrust of the cutting tool, and is so arranged that it can be lowered to permit easy removal of the outer plate when taking off or putting on work. Adjustment is made by a cam on the shaft *L*, the construction being such that when the proper height is reached the cam can be rotated no further. The support can be locked in position by the screw *M*.

Multiple and Splayed Tools

A set of tools for machining flanged brasses in the slotting machine is shown in Fig. 7. The over-all distance of the outside tools is a little less than three-quarters of the width between the flanges of the brass. The outer tools are side tools and after one of them has finished the inside of one flange, the inside of the opposite flange is finished with the other tool. In finishing the body of the brass between the flanges the gang of tools is fed bodily in to the proper depth and then traversed. As the ends of all the tools are in the same plane, the amount of traverse necessary to machine the

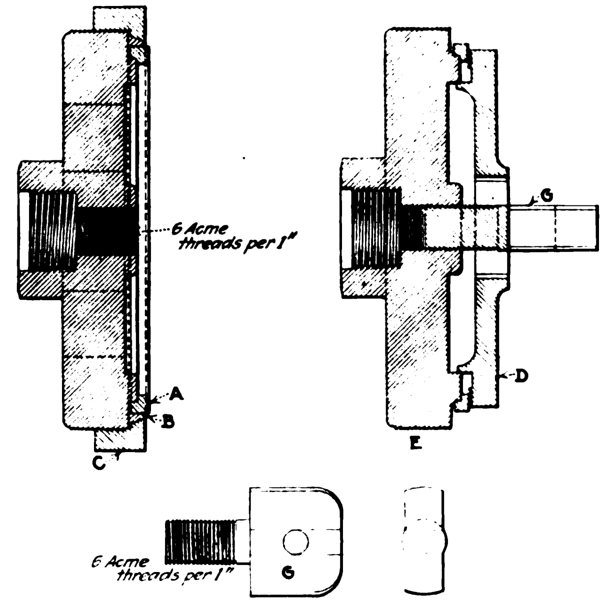


FIG. 10. DETAILS OF CHUCK, SHOWN IN FIG. 9

brass between the flanges is a little over one-quarter of the distance between them.

Small brasses without flanges are machined in a shaper by a splayed tool, as illustrated in Fig. 8, and it will be readily understood that a cut can be taken across the work by a tool traverse of about one-half the distance.

Turning and Facing Packing Rings

After a piece has been cut out of packing rings to give them a spring fit in the valve chamber, they must be compressed until the cut edges meet, turned to the proper diameter and faced on the edge where they were severed from the pot casting. A chuck for holding rings for this turning and facing is illustrated by the half-tone, Fig. 9, and in detail by the line-drawing, Fig. 10. The body of the chuck is provided with a projection to fit the notch in the side of the ring. When the ring *A*, Fig. 10, is in place inside the split tapered-ring *B*, the outer thread-ring *C* is screwed home, its tapered opening compressing both the taper ring and the packing ring. In this position the packing ring is held firmly and can be readily faced to the proper width. After facing, the cover *D* is put on as at *E* and clamped by the screw *G*. The outer and split rings can then be

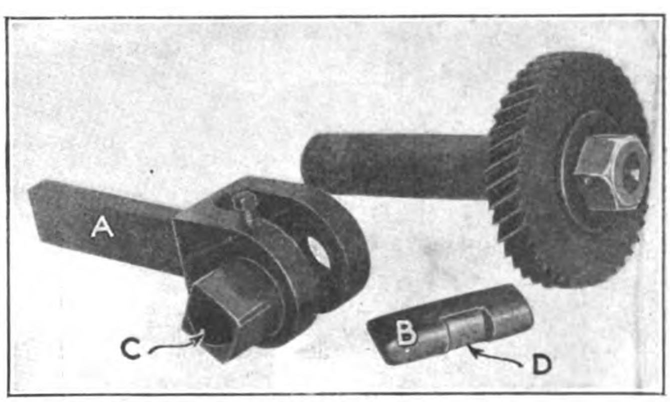


FIG. 11. TOOLS FOR SLOTTING SPRING-HANGER PINS

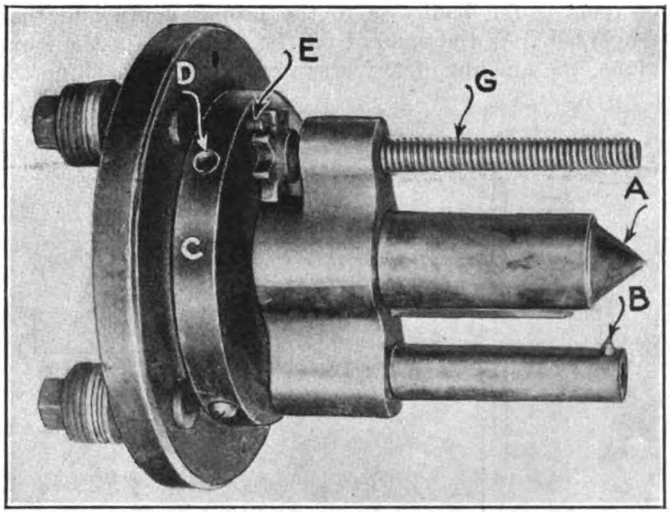


FIG. 12. DEVICE FOR TURNING LIFT-SHAFT JOURNALS

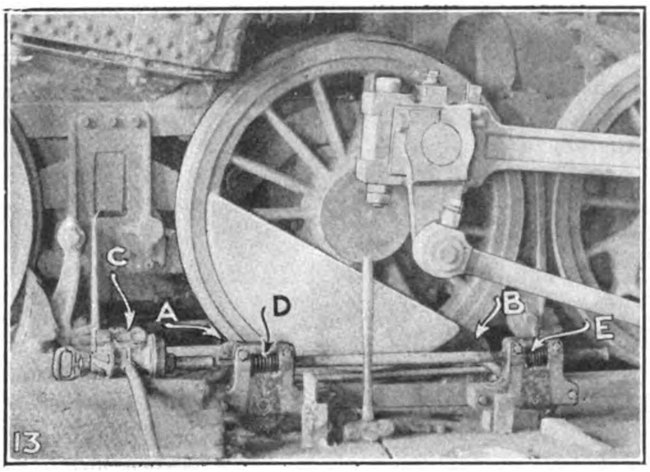
removed leaving the periphery of the packing ring exposed so that it can be turned to size.

Screw *G* need not be removed from the chuck as the cover is provided with a central hole of such size and shape as to allow it to pass over the oblong head of the screw.

A spring-hanger pin is a rough forging and the only machine work required to be done on it is the milling of a slot in one edge to catch in the spring eye and keep the pin from slipping out endwise. The tools for cutting this slot are shown in Fig. 11. The shank of the holder, *A* is held in the toolpost of a lathe and the pin *B* is placed through the oblong opening of the sleeve at *C*. With the milling cutter held between the lathe centers and the pin fed against it until the proper depth is reached, the sleeve *D* is rotated by a wrench on its squared end. As the pin rotates with the sleeve, the slot is milled with a convex bottom as at *E*.

Device for Turning Lift-Shaft Journals

Turning the journals on lift shafts under ordinary conditions requires a lathe of at least 40-in. swing and is an ugly job as the operator is liable to injury from the long projecting arms as they revolve. A device for turning lift-shaft journals while the shaft is held stationary is shown in Fig. 12. The device is fastened to the faceplate of a lathe, the center at *A* taking the place of the usual live center. With the lift shaft mounted between centers, and held stationary by the arms resting against the lathe bed, the journal is turned by the tool *B*. The collar *C* is held stationary by a pin screwed into the tapped hole *D* resting against any convenient part of the machine. As the rest of the device revolves, the star wheel strikes the pin *E* and gives part of a turn to the feed screw *G*, feeding the tool along the journal.



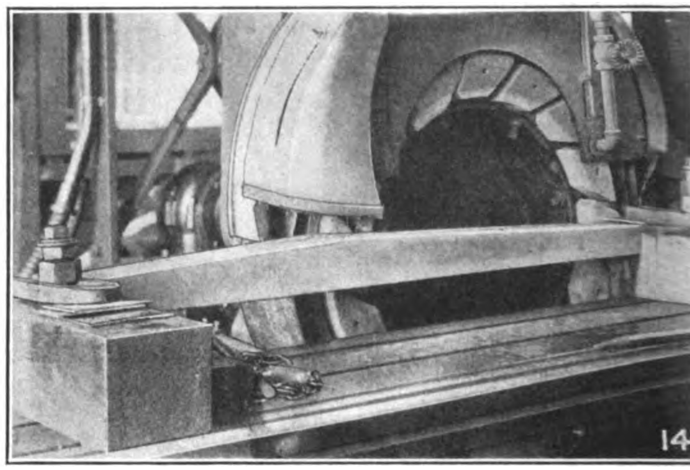


FIG. 13. APPARATUS FOR REVOLVING DRIVING WHEELS. FIG. 14. GRINDING CROSSHEAD GUIDE-BARS

In Fig. 13 is shown an air-driven apparatus for revolving the driving wheels of a locomotive when setting the valves. One pair of driving wheels rests on rollers, two of which are located at *A* and *B*. The other rollers being under the driving wheel on the opposite side of the engine, are not visible. The rollers are driven by an air motor at *C* through worm gearing at *D* and *E*. This device is very convenient and besides saving time and labor, takes up but little storage room when not in use.

Crosshead guide-bars are trued up on a Diamond face-grinding machine, using abrasive blocks set in a chuck in place of a cupped wheel, as can be seen in Fig. 14.

Driving-wheel tires, when worn so that they are only fit for scrap, are removed from the wheel centers by cutting through with a gas torch. Fig. 15 shows a tire so cut, the cutting time being less than two minutes.

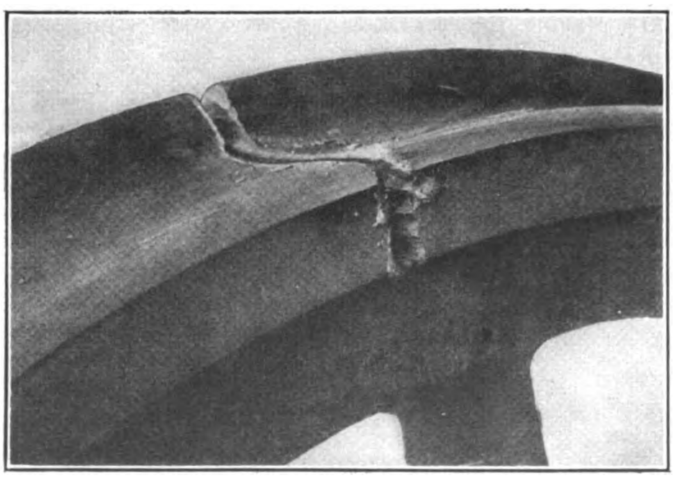


FIG. 15. TIRE CUT BY A GAS TORCH

All the tools herein described, with the exception of the Moss chuck were either designed by or built under the direction of S. L. Gary, machine shop foreman.

Methods of Machine Tool Design

Conclusion of the First Article—Design of Commercial and Single-Purpose Machines Contrasted—Shorthand Symbols for the Designer

BY A. L. DELEEUW

PERHAPS the most essential thing the designer should keep in mind is that he must never try to solve more than one problem at a time; and while he is busy with the general problem of the construction of the machine he should not trouble his mind in regard to any details. He should simply take for granted that he will get what he needs for the building up of his scheme.

To elucidate let us take an example. We are given a piece in which three holes must be drilled in three different planes and which must be milled in one of these planes, and we are asked to design a machine that will automatically perform these operations, but in which the piece will be chucked by hand. Fig. 1 represents this piece.

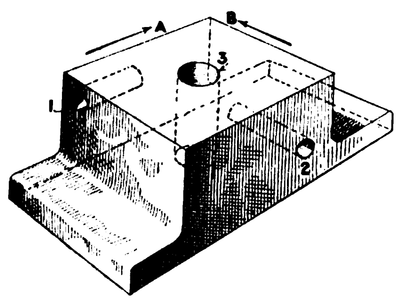


FIG. 1. SAMPLE PIECE TO BE MILLED AND DRILLED

We see immediately that it will be a very simple matter to hold the piece during the operation. We must lay it up against a stop and we must bring clamps down on the projecting flanges. We notice that hole No. 3 is in the surface which must be milled, so that the milling and drilling cannot take place at the same time. An investigation of the piece shows us that the three holes do not intersect each other, so that it will be possible to drill all three at the same time. Knowing that it is not possible to do all operations at the same time, we will try to do the next best thing and have two operations, though, of course, with one setting.

WHICH OPERATION FIRST?

The only question left to decide is this: Shall we first drill all holes and then mill; shall we first mill and then drill all holes; or shall we drill two holes and mill the surface and then drill the third hole? Suppose we make up our mind that there is no good reason why we should follow the third scheme and that there are several good reasons why we should not; reasons like this, for instance—that as we have a feed motion for two drills we might just as well employ this feed motion for the third drill also. Suppose, then, that we have eliminated the third choice. The question now is: Shall we first mill or drill?

Starting the drill for hole No. 3 will be facilitated if we mill first; it will also be possible to bring the jig-eye for this drill closer to the work. This seems to us to be a sufficient reason to adopt the first scheme, namely, mill first and drill afterward. We can now make a mental picture of the machine we will have.

There will be a surface on which the piece will be located, with the necessary stops and clamps. There will be two drill heads, one to the right and one in front for holes Nos. 2 and 1. This makes it probable that the loading side will be opposite hole No. 2. There will further be a slide, or slides, for the third drill spindle and for the milling spindle. It is not quite certain at the present whether we will use a spiral mill or an end mill. Considering this matter in a preliminary way we feel that the end mill will make a more open construction and perhaps somewhat simpler, and we therefore consider this construction as our first choice. However, we make a note of the fact that the other construction is also a possible one.

The drill spindle as well as the milling spindle must have a transverse movement; the one for getting into position and out of it, the other for the feed, and it seems reasonable to combine these two spindles in one slide. Of course, it would have been possible to make the milling spindle move in the direction of arrow *A* and the drill slide in the direction of arrow *B*, but we see no arguments in favor of such a construction. We will combine both slides into one, move the slide over by means of a cam while milling, and bring it to rest against a stop, after which the drill spindle will come into action.

WORKING OUT THE GENERAL SCHEME

It should be noted that we have now before us a general scheme of a machine, but without any details. And it should be kept in mind that it may very well be possible that later on we may be induced to change this general scheme because one of the details offers so many difficulties that it is not wise to pursue the original plan. However, we will now use the plan as we have it, analyze it, and determine what are the different elements which we must provide.

So far as we have outlined this machine it is, in reality, a combination of machines; or, if one wishes to call it so, a combination of functional units: a unit for holding the piece, two units for drilling holes Nos. 1 and 2, and a unit for drilling hole No. 3 and for milling. Each of these units must be analyzed. So far as we can see no difficulties present themselves at all in regard to the means for locating and holding the piece. Each of the two drill spindles for holes Nos. 1 and 2 must have a driving and a feeding mechanism, and the unit for hole No. 3 and for milling must have two distinct driving and feeding mechanisms and a return for the slide to its original position. We take for granted that we will be able to meet all these requirements and do not trouble ourselves with doubts as to difficulties we may encounter.

Determining the construction of drill spindle for hole No. 1 we would follow a reasoning somewhat like this: This spindle has to drill only one size of hole and always to the same depth. Therefore, the spindle requires only one speed and one feed. And as the depth is always the same it is possible to accomplish this feeding by means of a cam. However, as the drill wears we would get holes of different depths unless we have some means either for adjusting the drill or the spindle or the cam, and we will keep this in mind.

We will not go further into this matter at the present time, as the foregoing seems to be sufficient to indicate the general line of thought we must follow and how we work closer and closer to the details as we go along, always keeping in mind that it may be necessary to change our plan in case we should meet an insurmountable difficulty.

Commercial Machine Presents Different Problem

The example we chose was that of a special machine, in which the requirements are very definite. We are confronted with an entirely different problem when we must design a commercial machine, or rather we should say, a general utility machine. Merely looking at the piece to be machined placed the requirements of the special machine before us in a very definite form. When it comes to the design of a general utility machine we have no starting point for an analysis of its requirements. In fact, determining the requirements of a general utility machine is not a part of the designer's work. This should be done by the sales department which, however, should consult with the designers as to the possibility or advisability of embodying certain features in the proposed design. It is regrettable but nevertheless very true that most lathe spindle bearings are not proportioned according to the best machine design practice, but according to the proportions of a similar spindle of a similar lathe made by the closest competitor. Whether this is good practice or not makes no difference; we may just as well recognize the fact that competition is one of the controlling factors in machine tool design and that the practice will continue until the buying public has been educated to a point where it can judge for itself as to the merits of a machine tool. Even now there seems to be some improvement along this line, caused by the fact that some of the larger concerns who buy machine tools entrust the work of specifying and analyzing to their engineering departments, leaving the commercial end of the buying to the purchasing department.

Though the designer of a commercial machine is much handicapped by these conditions, it must not be thought that there is no scope for his work. He has to proportion the machine and provide new features and mechanisms. He has to take into consideration the fact that a complete line of such machines may be built, either now or in the future. He should construct the machine so that some of the units can be used interchangeably on a number of sizes in the line and build his machine out of functional units, which may be combined in various ways so as to make up a number of styles of machines. For instance, a single feed box unit may be used for two or three sizes of machines; a single drill head may be used for a number of sizes of radial drills, etc.

Advantage of Interchangeable Units

The building of a machine out of interchangeable units becomes possible by dividing up a machine into functional units. We may have a unit for the drive, another for the feed, still another for quick traverse, another again for the supply of cutting compound, etc. Each of these units should be treated as a separate machine. It is only necessary to provide a place on the frame of the machine to which this unit can be bolted; and if a number of different machines all have the same bolting surface and the same means for connecting up with the mechanism contained in such a unit, it follows

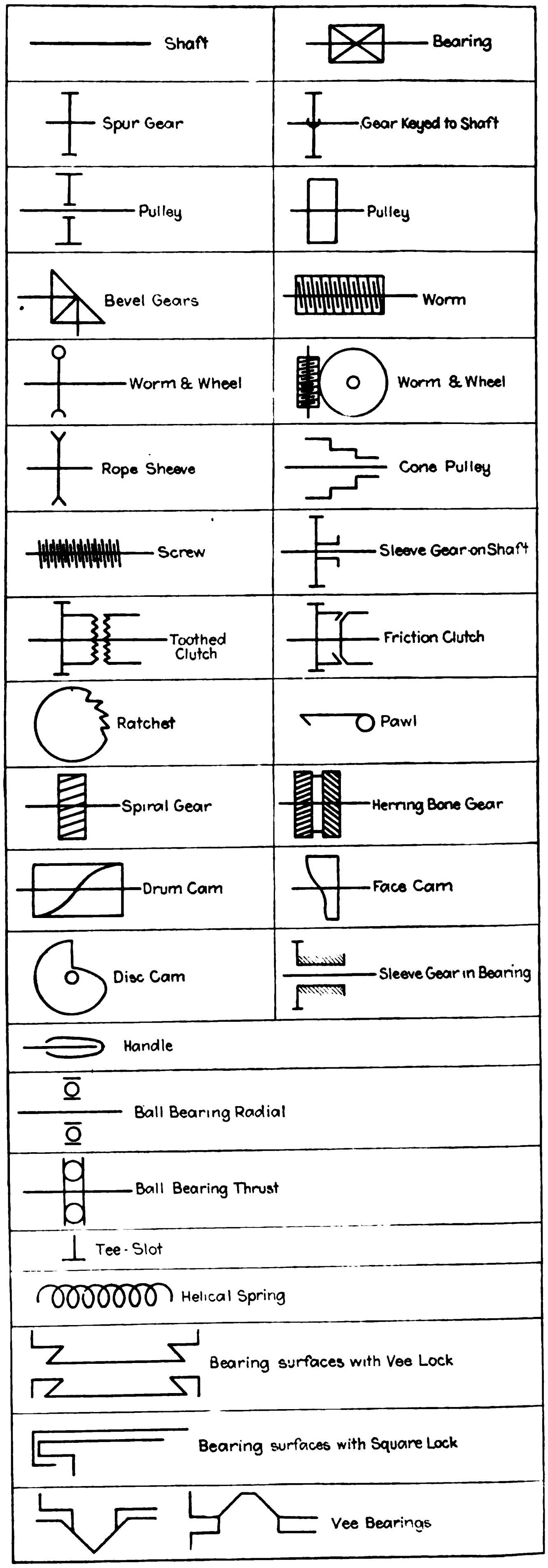


FIG. 2. DESIGNER'S SHORTHAND SYMBOLS

that that unit can be used on such a line of machines. This system of building machine tools as far as possible out of functional units leads to great economy in the building of the individual machine and makes possible an almost endless variety of combinations; in other words, it makes the line of machinery built by a manufacturer as elastic as it is possible to make it.

Some twenty or thirty years ago, if a new machine had to be developed, it was quite the customary thing for the proprietor of the machine tool establishment to hunt around in the pattern storage to see if he couldn't find some pattern which might be made the basis of the new machine. He was willing, of course, to make some slight modification in the pattern, but the idea that no new expensive pattern would have to be built for the main part of the machine was so alluring that this method of starting a new machine tool was quite the regular practice in those days. It was left to the unfortunate newcomer in the machine tool business, the man who did not have a lot of old scrap patterns lying around, to design the machines from the ground up, and, in the opinion of the writer, this may have been one of the main reasons why the most important developments in machine tool design did not originate with the older and best established concerns.

It is almost unnecessary to say that the old practice, should it still exist, must be abandoned. *The frame of a machine must be built around its mechanism, and not the mechanism into the frame.* There is not so much danger at the present time that the old method will be followed. Thirty years ago practically all of the mechanism of a machine was hung on the outside of the frame, and it was a simple matter to adapt the frame to a new kind of mechanism merely by changing a few bosses or pads. Nowadays it is customary to have the mechanism completely covered, preferably by the frame itself, so that changing over from one mechanism to another almost necessarily means the making of a new frame.

Mention was made of the necessity of confining the mind to one problem. The human mind is so constructed that it cannot contemplate more than one thing at a time. However, when analyzing a problem the designer will naturally find a number of items which are not obvious and which he must solve, and it may well be that in solving one item a certain way he makes the solution of another item more difficult or even impossible. Nevertheless, he must take up one item at a time. When he has solved number one he should go on and solve number two, and then check the one by the other; after which he can go on with number three and check its solution by number one and number two. It may often be that the designer finds more than one solution for a single problem. If he does, he should select one which appears best to him, but make a note of the others, so that, if he should find later that the first solution selected by him leads to trouble later on, he will be immediately in a position to substitute a new solution for the one discarded.

It has been the writer's experience with draftsmen and designers that they often speak of the *troubles* they meet in the design of a machine. This term should never be used. The only thing one can meet in the design of a machine is a problem. It is only when the designer tries to solve more than one problem at a time that he gets into *trouble*, but this trouble is of his own making.

While on the subject, which might almost be called the psychology of design, the writer cannot resist the temptation to mention the kind of idea, almost superstition, which seems to prevail that the ability to design a machine is a wonderful gift, the result of genius of some kind, and that the designer is fully entitled to the artistic temperament and all its attributes. There are a great many stories in circulation about designers who need a couch in their office because inspiration will not come unless they are in a horizontal position and supported by cushions of a certain degree of elasticity. Other stories tell of the designer who gets wan and thin from the intensity of his efforts; who for days is groping for the intangible idea which is constantly flitting around his head like a mosquito in summertime, but upon which he can no more lay hands than upon the aforesaid mosquito. Then, one night he wakes up from a deep sleep (generally about three o'clock, though the writer does not know why another hour would not do just as well), and he finds that his guardian angel

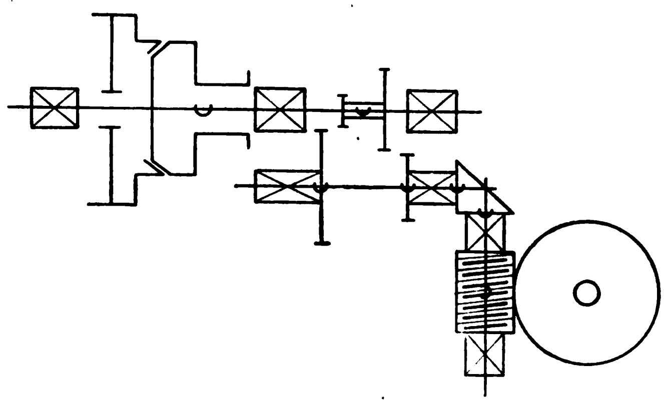


FIG. 3. A MECHANISM INDICATED BY SYMBOLS

has worked out the entire problem during his sleep and that all he has to do now is to sit down in his pajamas and put the thing on paper, after which the designer can once more give his attention to the now very necessary process of getting back to normal weight.

As a matter of fact, designing a machine is nothing else than a process of careful analysis and patient selection and checking of elements and devices with which the designer is supposed to be familiar. This is not an easy task, but neither does it call for gifts which a well-prepared engineer does not possess.

To a certain extent the preliminary analysis of a machine can be carried out without any drawings. In fact, drawings would be of no advantage as long as we have no clear idea of the construction of the units which we employ. It would not be possible, for instance, to represent a feed box by a drawing unless we have a very clear idea of the construction of that feed box. By and by, however, the analysis brings us closer to details, and it becomes necessary to find some way of representing our ideas on paper in some other way than by words. To make a complete drawing of a device when we know almost with certainty that we will modify it in every detail later on does not seem attractive. Drafting is a slow process, and the careful putting down of details of gears and shafts and clutches is not necessary until we have, and wish to preserve, all the dimensions and details of these elements. To overcome the necessity of making drawings which later

on will be annihilated, the author has been using for many years a set of symbols for various machine elements. One might call it a "drafting shorthand system."

In Fig. 2 are shown the symbols referred to. This, however, does not mean that somebody else could not use other symbols equally good and more in harmony with his personal taste. Fig. 3 shows an arrangement of a gear mechanism represented by means of these symbols. There is a pulley with friction clutch, the clutch being keyed to a shaft. To this same shaft is keyed a pair of sliding gears which can mesh with two stationary gears on another shaft; and to this second shaft is keyed a bevel gear, driving another bevel gear on a third shaft, on which is keyed a worm driving a worm wheel. It takes only a few minutes to draw up such a complete mechanism preparatory to analysis.

This matter will be taken up more in detail in the following chapters.

Training Leaders for Foremanship Classes—Discussion

By J. T. Towlson

In respect to that most interesting article by D. J. MacDonald under the above title, on page 249, Vol. 55, of American Machinist, it is hoped that what a foreman with an experience of over thirty years has to say on the subject will be of some service, as well as interest. The shop foreman, the ideal one, is born and not made, as the saying is. In any case, his making is not by others, but by himself. If he is of the material from which real foremen are made, he will possess just the correct amount of common sense to enable him to gather knowledge, both of men and of machines; while if he does not possess, or is not constituted of the right kind of material, no instruction will ever bring him up to within miles of the ideal foreman.

I have found that many briefs have been held, and rightly so too, on behalf of the rank and file of the men engaged in our engineering industries; and also that earnest and intelligent writers have penned lengthy dissertations, setting forth the difficulties, the responsibilities and the burdens of employers. But, as to the foreman—whether it has been supposed that a super mechanic who has dropped into a foremanship is so exceedingly fortunate as to be quite outside the pale of any possible reason for dissatisfaction, or whether it has been assumed that he is identified with a sufficiently intelligent and progressive class which is well able to assert its right—no one has seen the need of holding a brief for him. The number of writers who have assisted in adjusting his real or imaginary bearings are lamentably few, so the only thing to be done is to take up the cudgel for him.

There need be no hesitation in stating, for it is so well known, that his remuneration is small—too small, and besides this that he is a kind of "buffer state" between master and man. There is also a sad want of respect shown to him from those who have thought so well of his value and capabilities as to place him in charge of a hundred or so men and machines.

For the purpose of making it sufficiently clear to the reader the type of shop foreman referred to, it may at once be said that there are several classes, and of these three stand out distinctively.

Firstly, the real live man, who by insistent observation and study of men and machines, and who by a naturally quick and intelligent grasp of the elements that are calculated to build up the ideal foreman, and who by earnestness and solicitude to do right, all but succeeds in attaining the ideal.

Secondly, there is the man who, with less natural ability and talent, with lack of enthusiasm and grit, fails to reach a position or condition anywhere near that which should be the goal.

Thirdly, there is the foreman who has no natural ability, has wasted his time, neglected his books and possesses no enthusiasm and no ideal even as a mechanic. He has been "pitch-forked" into the position on account of his policemanship proclivities, or some other equally pernicious quality. He jogs along week by week, draws his pay and assumes no responsibility for work done. If a job is right, he did it; while if it is wrong, he had no hand in it. He puts up with all kinds of indignities without complaint, he possesses no pride as a mechanic or an engineer, and he depends entirely upon his men or his boss in all extra difficult jobs. He thus breaks on each and every day of his life every rule and law that tends to preserve the prestige and dignity of the foreman's position—a foreman only in name.

The foreman who is positioned in the first class of the foregoing category is in the first place a born mechanic, ultra practical, but with sufficient common sense to be aware that there is not that conflict between practice and theory that is commonly imagined by the ignorant. He is well read, in touch with modern ideas and has an all-abiding conscientiousness toward his employers, but none the less towards his men. Notwithstanding differences of pay, he considers himself the social equal of his better-paid associates; he is respectful to his managers, yet cannot be servile to any man.

Treatment of a Foreman

This ideal foreman expects to be treated as a gentleman, for such he is; he requires to be consulted in respect to changes in discipline and in the general control of his men and machines. He is ready and willing to co-operate and to second the wishes of his bosses, if he is so consulted.

It will, then, be readily understood that this kind of foreman will rightly deem that his dignity has been lowered and his prestige assailed if he is not treated in the proper manner. The absence of respect and trust will go far to render him dissatisfied, tending to cripple his valuable initiative, and crushing with loss to his employers his individuality. There may be times when he wishes himself back at his tools again. He is often paid at too low a rate, although he may be entrusted with the execution of costly work, the profit from which he is well able to make or to mar.

It would be well for Mr. MacDonald to direct his valuable efforts toward training teachers of managers, especially in the direction of enabling the managers to understand the shop foreman's mentality. He might show them the unprofitable effect of inflicting strict rules and regulations, and enable them to understand that man-to-man treatment of such vertebrates would be found infinitely more productive of profit, than a system which includes the papering of the shop walls with "Thou shalt nots" and dire penalties.

In closing my defense of my friends, the live shop foremen, with sincerity I state that employers would do well to make friends with their foremen, for certainly in that way lies success.

Machining the Peerless Crankshaft

Crankshaft for an Eight-Cylinder Motor—Double Connecting Rods Require Long Crankpin Bearings—Details of Oiling and Methods of Drilling Oil Holes

By FRED H. COLVIN
Editor, American Machinist

THE crankshaft of the Peerless eight-cylinder motor has four throws, a center bearing, and is counterweighted, as can be seen in Figs. 1 and 2. The pins are long enough to accommodate the connecting rods side by side, instead of rods of the interlocking or spade type. A good idea of the problems involved in machining this crankshaft can be had from Fig. 1, which shows the general dimensions as well as the design of the shaft, the location of the oil holes, etc. Where tolerances are not given, the practice of the Peerless company is to hold all dimensions given in fractions (except drill and commercial stock sizes) to come within plus or minus 0.010 in. Dimensions given in decimals but with no specified tolerance are to be within plus or minus 0.003 in. Where tolerances are given, they are, of course, to be followed.

The oil distributing channels are divided into three sections, one being fed from each main bearing and one from the center bearing. The center bearing feeds the second and third crankpins while each of the end bearings supplies oil only to the pin next to it. It will be noted that each crankpin has two oil holes, these being located so as to come in the center of each connecting rod bearing. The thread at *A* is cut simply to aid in keeping all the oil drip possible within the crankcase. The thread tends to carry the oil to the beveled flange which comes inside the motor casing so that the oil finds its way down into the pan instead of to the clutch. The sequence of operations is:

Operation 1 Sandblast.
Operation 2 Straighten.
Operation 3 Rough-turn center bearings and counterweights.
Operation 4 Finish-turn center bearings.
Operation 5 Turn flange and rear line bearings.
Operation 6 Turn front bearing and gear fit.
Operation 7 Turn pin bearings.
Operation 8 Re-straighten.
Operation 9 Drill holes in flange end.
Operation 10 Drill, re-center and finish face.
Operation 11 Grind flange.
Operation 12 Grind line bearings.
Operation 13 Drill and ream flange holes.
Operation 14 Drill, ⅜-in. oil hole through pin bearing.
Operation 15 Drill ⅝-in. hole through line bearings and counterbore for plugs.
Operation 16 Grind pin bearings.
Operation 17 Finish-turn flange and thread.
Operation 18 Drill ⅜-in. oil holes.
Operation 19 Drill and counterbore ¼-in. holes.
Operation 20 Face to proper length.
Operation 21 Tap holes in end.
Operation 22 Mill keyways.
Operation 23 Balance.
Operation 24 Inspection.

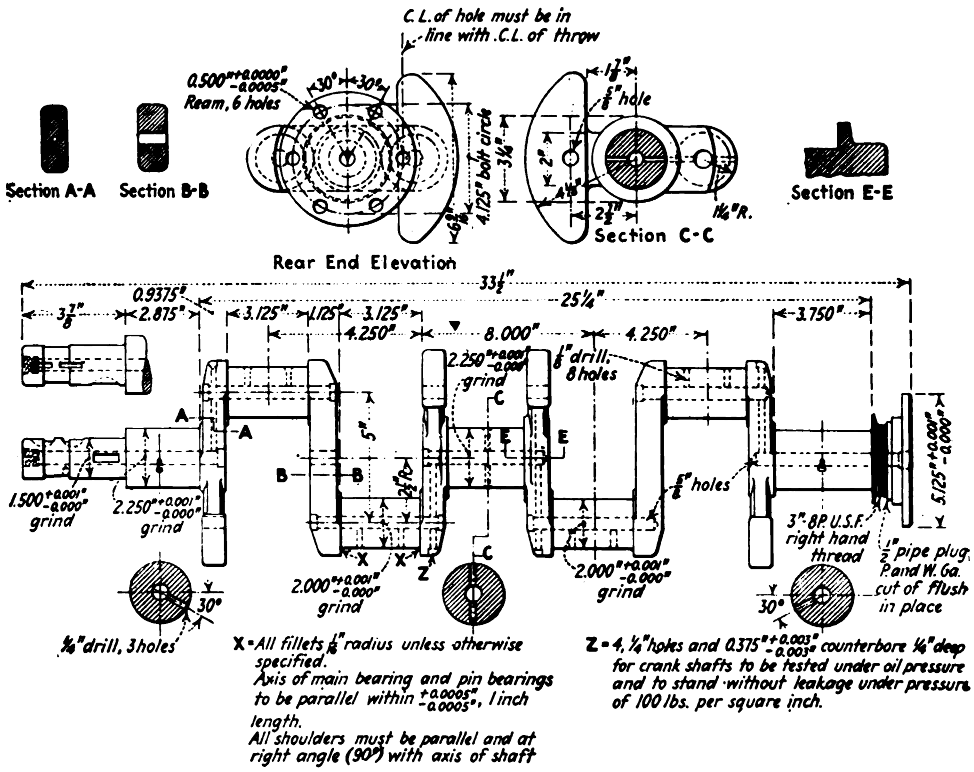
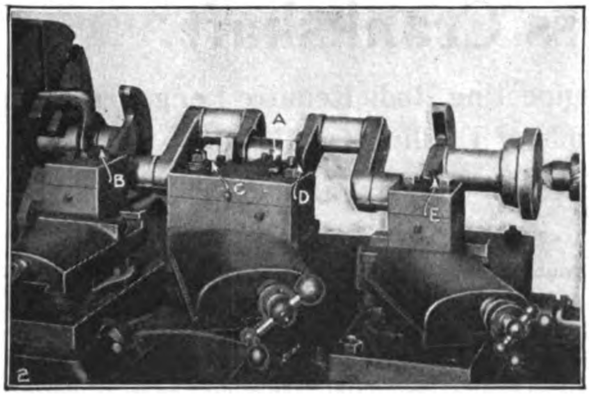


FIG. 1. DETAILS OF PEERLESS CRANKSHAFT

The rough-turning of the center bearings and also the counterweights is done on a LeBlond lathe as shown in Fig. 2. The gear end of the shaft is held in the four-jawed chuck shown, although a bent tail dog is also used to assist in securing sufficient driving power. The tool for the bearing is held in the special toolblock at *A* and is adjustable from the back by the screw shown. Tools for turning the four counterweights are held at *B*, *C*, *D* and *E*. The center bearing is also finish-turned on a LeBlond lathe.

Two methods are used for turning the four crankpins. Fig. 3 shows a Wickes lathe which drives the crankshaft from both ends and turns two pins at once. Each toolhead carries a broad-faced tool as shown at *A* and *B*. Ample lubrication of the cutting tool is secured by means of the two pipes which carry the cutting lubricant directly on to the pin being turned.

The other method of turning pin bearings is shown in Fig. 4, in which a LeBlond lathe is used. The crankshaft is driven from both ends, the middle pins being turned in the position shown. This arrangement holds the crankshaft very firmly and tends to prevent spring while turning pins 2 and 3. The crankshafts are gripped by the web and also by the other pins, jaws *A* and *B* being used for this purpose. These same chucks can be used for turning pins 1 and 4. The cross-slides carry two sets of tools, one for turning the pins and the other for facing down the webs or cheeks.



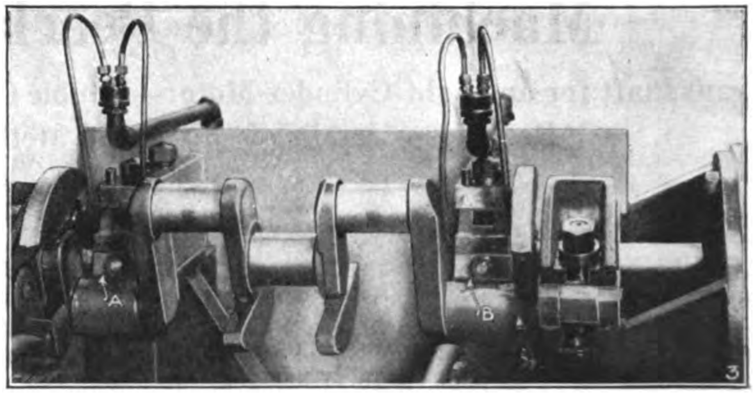


FIG. 2. ROUGH TURNING CENTER BEARING. FIG. 3. TURNING PIN BEARINGS ON WICKES LATHE

After re-straightening, to take care of any spring due to the rough-turning or the release of stresses in the forging, the flange holes are drilled and the flange and the line bearings ground. Three drilling operations are shown in Fig. 5. Beginning at the left the flange. is necessary to drill through one of the counterweights in order to get at crankpins 2 and 3. The long drill shown at *A* reaches down through the second pin and drills the next without removing the shaft from the fixture. The drilling of the end crankpins is shown at *B*,

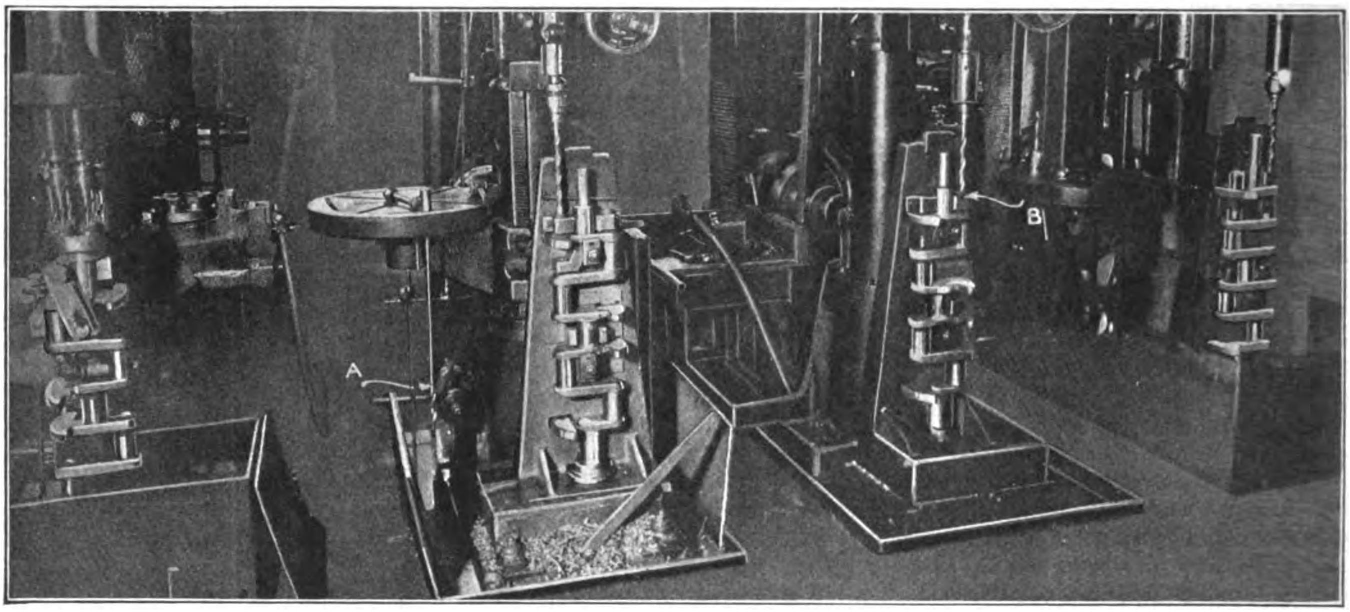
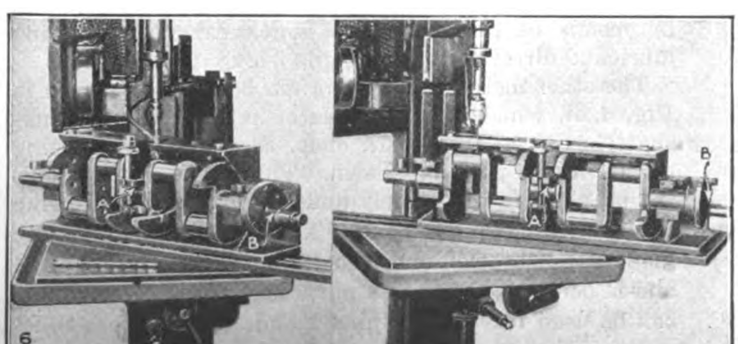


FIG. 5. DRILLING FLANGES AND OIL HOLES

holes are being drilled with a multiple-spindle head, while the other operations are the drilling of the oil holes through the bearings, as indicated in Fig. 1. These fixtures (Fig. 5) show how the crankshaft is held in position and how the drills are guided for the different drilling operations. It will be noted that it in which the two counterweights are drilled through to avoid changing the crankshaft end for end.

The pin bearings are next ground, after which the connecting oil holes are drilled in the crank webs and the distributing oil holes drilled in the bearings, as in Fig. 6, which shows the method of holding the crank-



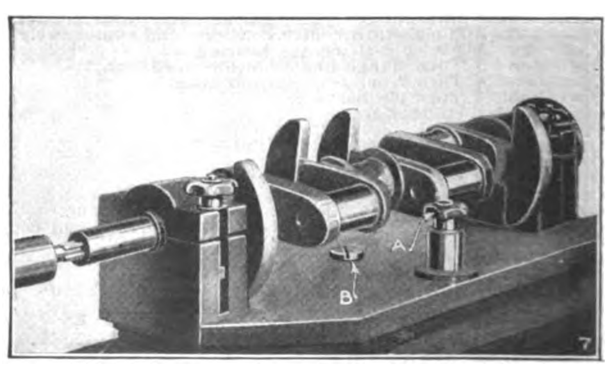


FIG. 6. DRILLING OIL PASSAGES AND DISTRIBUTING HOLES. FIG. 7. TAPPING THE ENDS

shaft, the central bearing being clamped as at *A* in both cases. The crankshaft is indexed by means of the flange holes as at *B*, and the outer end supported as shown. The same type of drilling fixture answers for both operations, making it unnecessary to transfer the crankshaft from one fixture to another. The drilling machines are conveniently placed so that the fixtures can be readily moved from one to the other.

The tapping of the holes in the end of the shaft is

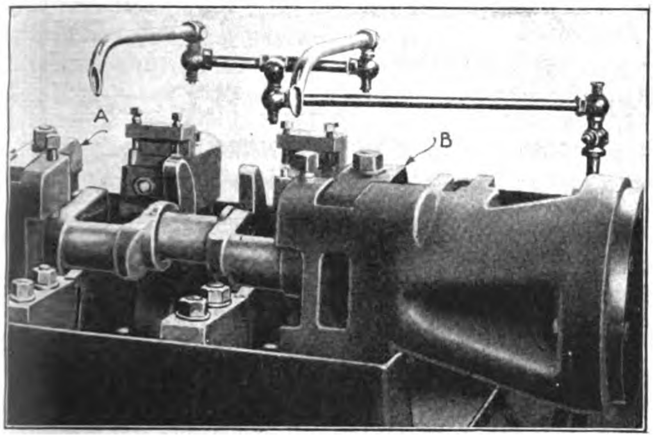


FIG. 4. TURNING PIN BEARINGS ON LEBLOND LATHE

done on an old lathe provided with the swiveling fixture as shown in Fig. 7. This fixture clamps the shaft by the end bearings as shown, the fixture being indexed by the pin *A* and swiveling on the stud *B*.

Saving Money in the Assembly Department

BY R. F. HELLER

In these days of economy and cutting down the costs of production the assembling department appears to be the one department where the greatest showing along these lines can be made. This is due to the assembling department usually being the largest, particularly in factories where minor machining operations to size are done in this department, and where the majority of operations are performed by hand. Opportunities to change from old methods to new are unlimited if the foreman is at all resourceful and such changes usually require little or no cost for new equipment.

To cite a particular instance, we have quite a number of close fitting jobs of studs and pins of all sorts on which the cost of grinding was prohibitive and we were at the mercy of the screw machine department as to quality. We pressed that department continually for better work until finally the foreman got an idea. He rigged up a still useful thread-rolling machine by grinding some obsolete threading dies smooth. He now rolls almost every stud and pin we use as smooth and round as one may wish, eliminating all the misery from the previous disagreeable fitting jobs, at less cost. Where very close fits of such pins and studs are required it is advisable to sort such work to size by a graduated taper gage, then it is easy to ream to fit.

Getting acquainted quickly with the various parts of a machine is the secret of success in assembling work, otherwise you work in the dark. In making changes great care must be taken to assign the proper grade of help to perform these operations under the new method so as to affect a full saving, as in most cases we contemplate changes with the idea of simplifying the operations in view. Under the old method it perhaps required three minutes for a skillful operator at the rate of 45 cents per hour to perform an operation. If under the new simplified method it required but two minutes for a 30-cent operator, it would be advisable to use the 30-cent operator and effect the full saving.

Great care must also be taken in setting new rates or time required to perform new operations. They must be set high enough to make it attractive to the operator to get full possible production. On the other hand, if set too high, besides the loss on the particular operation set wrong, it gives the operators a chance to make what they consider a day's pay too quickly and gives them time to idle away in gossip. In many cases this sows seeds of discontent among fellow workers and takes up the foreman's time in following up uncalled for troubles.

GIVE CREDIT FOR SUGGESTIONS

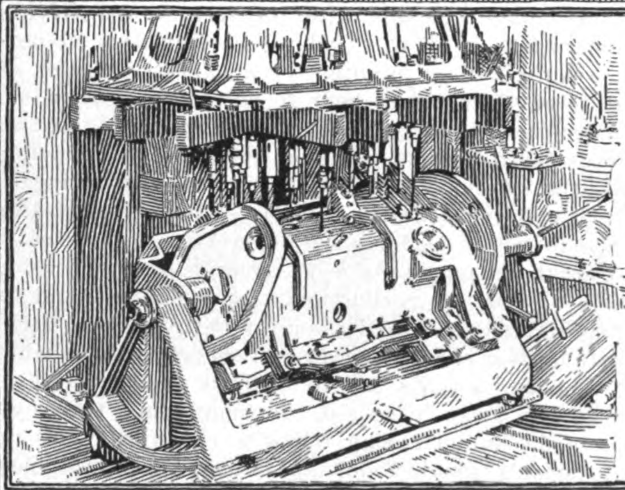
Many good suggestions can be derived from the operator by keeping in close touch with him, for he is thoroughly familiar with the operations he performs and if at all intelligent he is the most reliable source of information. It is well for a foreman when he receives such suggestions from his men, to mention who suggested them when he presents them to his superiors, as that will further encourage such suggestions from the men. The management in turn will give the foreman more credit than if he presented the suggestion to them, omitting to mention who in reality suggested it.

A foreman should never neglect to listen to kicks and complaints from operators about defective parts or material, though they may be put to him in a crude and most unbearable way. For, from such sources often come the best information as to further improvements. The best foreman is he who can listen to such complaints without his temper being the least affected. He can then bring these troubles to the attention of the proper sources and hammer continually until the trouble is removed. This affects a saving of scrap and of time in the assembling department, as this department is a source of information as to the quality of work produced in every other production department of the plant.

Scrap can be cut down considerably and time saved in sorting by having proper boxes to hold scrap and defective parts, each marked plainly, set at each operator's work place. The operator separates it as he finds it, and it also tends to make him more careful about scrapping anything he may be able to use, as he knows you are interested in what he scraps. These boxes should be collected at regular intervals.

In hiring green help it is usually customary to interview applicants as to their past experience and capability before placing them in positions they are fit for, as near as possible to your judgment. After presenting new help to a reliable operator or key man to break in, and seeing that he is fully equipped with necessary tools and material, it is always a good point to mention the fact of your conviction "That you feel sure he will do well" so that the new operator hears it. The new operator will appreciate that you expect him to make good and will seldom fail to come up to your expectations.

Make no promises that you cannot keep, but keep those that you do make. Give and demand a square deal. Be pleasant, never lose your temper and you cannot fail.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Engine and Turret Lathe Tools for Turning Spherical and Curved Surfaces—Internal and External Finishing—Generating and Forming Attachments

IN THE design of tools for turning spherical surfaces it is advisable, as far as possible, to generate the surface by swinging the tool on a radius of the required size. On small work of brass or of other materials of such a character that they can be readily formed, it is possible to obtain good results by the use of a formed tool carried either on the turret or the cross-slide. The method previously shown in Fig. 356 can be applied also to the forming of a spherical surface. It is an advantage to make tools self-contained so far as possible, and thus allow other tools to be used in the turret or cross-slide in the same setting of the work.

In Fig. 366 is shown a simple form of spherical turning device for the work *B*. The body of the tool *C* is fastened to the turret, and is U-shaped so that it receives a swivel member *D*. This member carries a tool *E* held in place by two setscrews *F*. The swivel is pivoted at *G* in the body of the holder. The upper portion is attached to a stem *H* in such a way that it can be readily turned by moving the handle *K*. The stem *H* is fitted with a stop pin *L* which comes to rest against the stud *M*, thus limiting the movement of the tool.

In operation, the workman feeds the tool by hand by grasping the handle *K*, thus generating the surface. Tools of this sort can often be used for small work; but it is important that they should be used as close to the end of the spindle as possible, in order that the work does not have too much overhang and thus cause vibration. Particular attention must be paid in the design to the rigidity of the tool, as no support is provided.

When a forming plate is used for controlling the shape of a curved surface, a very simple arrangement can often be made. An example of this sort is shown in Fig. 367, where the work *A* has the projecting end rounded as shown. This operation does not require a particularly accurate job, yet the stock must be removed and a smooth surface machined. The bracket *B* is attached to the ways of the lathe and carries a forming plate *C* as shown. The cross-slide is fitted with a toolblock *D* in which the tool *E* is carried. Adjustment is made by means of the setscrew at *F*. At one end of the block the roll holder *G* is fastened in such a position that the roll *H* comes in contact with the form plate.

For the authors' forthcoming book.

In operating the device, pressure is applied either by weight or springs in the direction indicated by the arrow at *K*, thus holding the roll firmly against the form plate. The crossfeed screw feeds the tool across the end of the work, and the direction of travel is controlled by the contact of the roll with the plate. A very simple device somewhat cheaper than the attachment can be made by using a form plate carried directly in the tailstock of the lathe. This does not require a special bracket *B*, and it can be made up somewhat more cheaply.

Inside Generating Tool

Considerable ingenuity is often needed in designing a tool for boring an inside curved surface. A simple device for this purpose is illustrated in Fig. 368. The work parts *A* and *B* are fastened together so that the two pieces are bored at the same time. The body of the toolholder *C* is held on the cross-slide of the lathe by a simple bracket. The forward end of the bar is piloted at *D* in the work. A slot is cut entirely across the bar at *E*, and in this slot a swivel member *F* is carried. The tool *G* is inserted in the swivel member and held in place by two setscrews, as shown. One end of the swivel block is cut in pinion form as indicated at *H*.

The side of the bar *K* has a rack cut upon it which

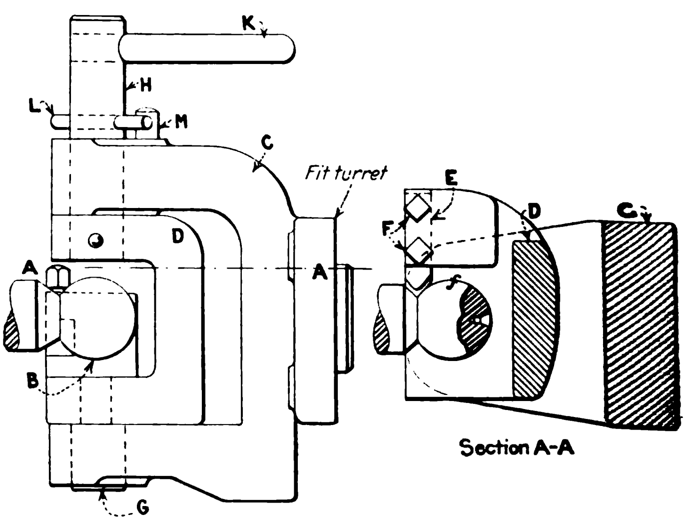


FIG. 366. SPHERICAL TURNING DEVICE

engages with the pinion *H*. The end of the bar *L* enters the hole at the end of the holder, thus giving additional support. The bar *K* extends entirely through the holder *C*, and is furnished with a stiff coil spring at *M* acting against the collar *N*. In operating the device, the cross-slide is moved into position and locked; after which the tailstock is screwed up against the end of the collar *N* and the feed is obtained by movement of the tailstock screw.

In Fig. 369 is illustrated a device used for turning the spherical surface *C* on the work *A*, which is held in chuck jaws *B*. The surface is generated by a radial movement and not by a form in this case. The cross-slide *D* is fitted with a bracket *E* on which is mounted a swiveling member pivoted at *L*. This swivel contains a toolholder *G* in which the tool *F* is adjustably held. The member *H* is fastened to the turret face and connected with the link *K* fastened to the swivel. The forward movement of the turret causes the tool to

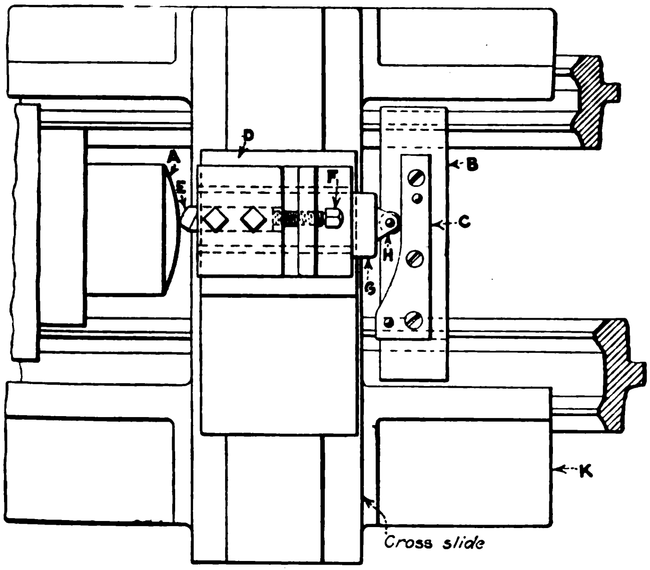


FIG. 367. DEVICE FOR ROUNDING THE END OF A CASTING

travel in an arc of the desired radius, so that the curved surface is produced by a true generating action.

Care must be taken in designing tools of this sort to make sure that the swiveling member is well supported and gibbed, so that there will be no lost motion or vibration. In the case shown, the swivel is turned circular at *M* and is held down by means of a circular strap *N*, which is fitted carefully so that there is no looseness. If required for a large diameter, it may sometimes be necessary to design a special cross-slide to hold the turning tools, in order that sufficient support for the swivel member may be obtained. The designer should be very careful to lay out the extreme movements of the swivel in both directions, to make sure that there are no interferences.

Spherical Turning Attachment

There are numerous cases in which a simple attachment can be made for an engine lathe to turn a spherical surface, such as that shown at *A* in Fig. 370. The work in this case is held on an arbor *B* driven by a special dog *C* in a slot in the faceplate. The outer end of the arbor is supported by a center in the tailstock *D*. The ordinary positions of the carriage and tailstock are reversed when using this fixture, as the tailstock is placed between the carriage and the headstock.

A special bracket *F* is fastened to the ways of the machine directly under the work, and on this bracket a swiveling member *G* is mounted. This member car-

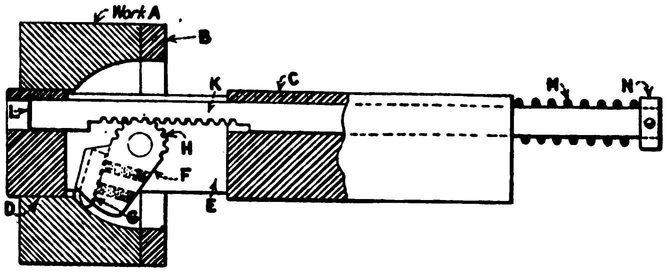


FIG. 368. INSIDE SPHERICAL GENERATING TOOL

ries a toolblock *H* in which the tool *K* is supported. The toolblock *H* is so arranged that it can be adjusted readily toward the center pivot *N*, so that various diameters can be turned. The carriage *E* has a block *L* fastened to it and connected to the link *M*, the other end of which is attached to the swiveling block *G*. It is only necessary to set up the work in the desired position and use the longitudinal carriage feed in the regular way. The tool *K* then travels on the circumference of a circle, the size of which depends upon the distance the tool is set from the center.

The operation of this device is very simple and the design is economical with regard to construction cost. In the example shown, the tool *K* is at the rear of the lathe so that there is a lifting cut upon the swivel. It would probably be better to arrange it so the tool is at the front of the lathe, as the pressure of the cut would then be downward instead of upward. The general details of the arrangement would be the same in either case.

Combined Curved and Straight Turning

It is rather difficult to turn a given diameter so that it becomes perfectly tangent to a curved surface on the same piece of work. In the example shown in Fig. 371, the end of the work is turned to a radius *A* which becomes tangent to the outside diameter and forms a

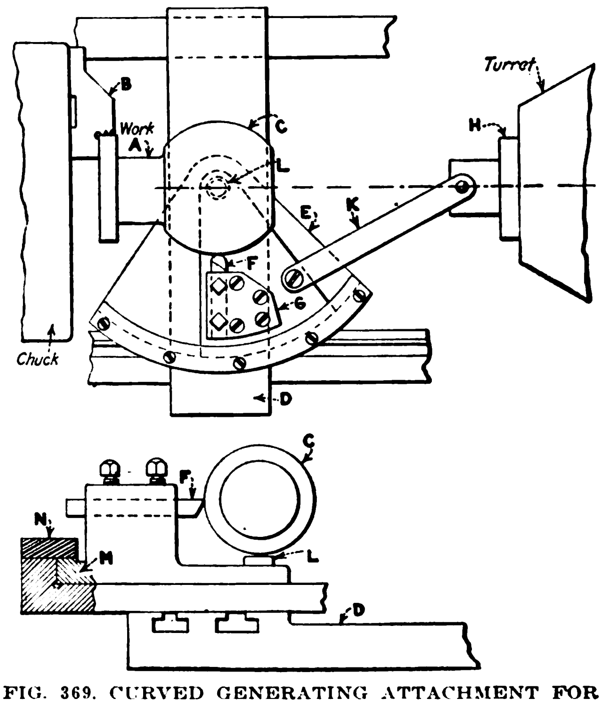


FIG. 369. CURVED GENERATING ATTACHMENT FOR TURRET LATHE

continuation of it. In order to make sure that there would be no interruption or shoulders on the work, it was decided to develop an attachment in which the same

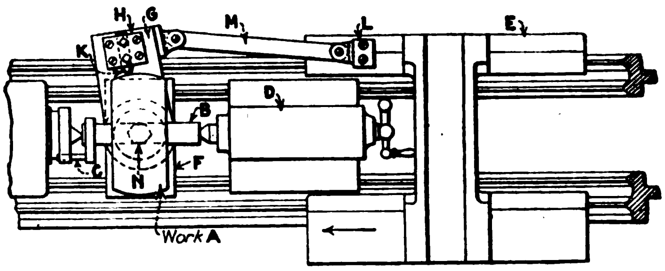


FIG. 370. SPHERICAL TURNING ATTACHMENT FOR ENGINE LATHE

tool would cut the radius and turn the outside diameter.

The work is held on centers in an engine lathe, and the regular cross-slide is removed from the carriage. A special bracket *B* is bolted to the back of the carriage, as shown, and in this bracket a dovetailed member *C* is fitted so that it will slide freely in a longitudinal direction. A link *D* of the proper radius is pivoted at *E* on the sliding member. The other end *G* is pinned to the block *F*, which is attached to a special toolslide *K* fitted to the dovetail on the carriage. This toolslide carries a turning tool *H* held in place by setscrews and furnished with a backing-up screw for fine adjustment. The latter is not shown in the illustration.

The block *L* is fastened to the sliding member *C* in such a position that the shoulder *M* acts as a stop against the radius bar *D* at the completion of the radius-turning movement. The rod *N* is fastened to the end of the slide *C*, and passes through a bracket *R* which is securely fixed on the ways of the lathe. The spring *P* thrusts against the collar *Q* pinned to the shaft, which latter is a sliding fit at *O* in the bracket mentioned.

In operating the device, the carriage is fed in the direction indicated by the arrow at *S*, and the radius rod remains in contact with the stop *M* while work is being turned cylindrical. When the collar *T* strikes the edge of the bracket *R*, the cylindrical turning operation ceases and the radius turning starts. It is evident that the movement of the member *C* is arrested at this point, so that the motion of the slide is controlled by the longitudinal feed of the carriage and the tool *H* travels about a center as constrained by the bar *D*, thus completing the work.

In generating a radius on the inside of a piece of work, the tools used for the purpose are affected very largely by the size of the work and the accuracy required. When a condition like this is found, great

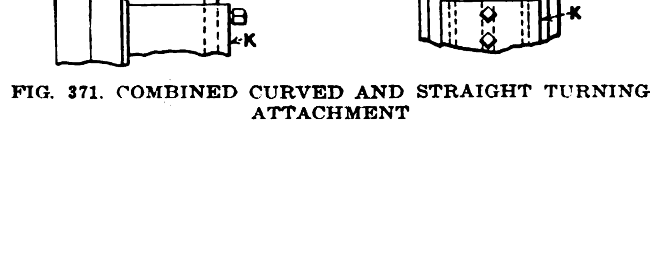


FIG. 371. COMBINED CURVED AND STRAIGHT TURNING ATTACHMENT

care must be taken in the design of a generating tool to make sure that it has sufficient rigidity to withstand the pressure of the cut. A support for the end of the bar in which the generating attachment is contained is of great importance.

In Fig. 372 is shown a piece of work *A* held in chuck jaws *B* on a turret lathe. The inside curved surface is to be generated to a true spherical form. The chuck is furnished with a bushing *C* which acts as a support for the bar *E* held in a bracket *D* on the face of the turret. The end of the bar *F* enters the bushing, and a collar *G* comes against the face of the bushing and acts as a longitudinal stop, thus positioning the bar.

The boring tool *K* is held in a swivel block *H* in a slot in the bar. It is pivoted at *P*, and a link *L* connects the swivel member with the sliding block *M* which is fitted to a longitudinal slot in the bar. The link *N* connects the bracket *D* with the sliding block mentioned, so that

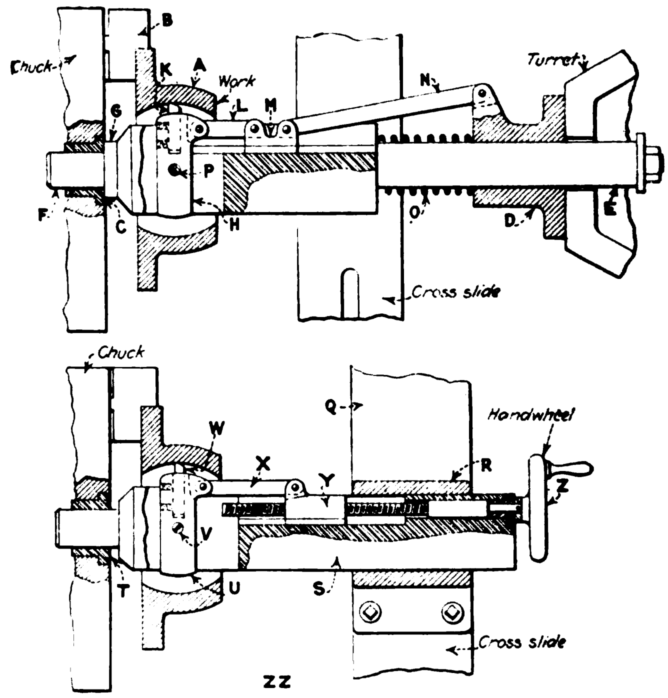


FIG. 372. TWO METHODS OF BORING AN INSIDE CURVED SURFACE

the tool can be fed. A heavy coil spring *O* is placed between the shoulder of the bar and the end of the hub on the bracket *D*. This spring keeps the thrust washer *G* up against the face of the bushing *C* at all times. In operation, the turret is moved forward until the tool is in position ready to start the cut, after which the feed is engaged. The turret then travels forward, carrying with it the bracket *D*, pushing the link *N* along, and thus causing the tool *K* to describe the proper radius.

A somewhat similar arrangement for the same piece of work is shown at *ZZ*. This application, however, is made to an engine lathe. The cross-slide *Q*, has mounted upon it a holder *R*, into which the bar *S* is clamped. The end of the bar is piloted in a bushing at *T*, but no stop collar is used. A swivel block *U* is provided with a pivot at *V* and contains the tool *W* which does the boring. This block is connected by means of a link *X* to the block *Y*, which is tapped to receive a threaded rod connected to the handwheel *Z*. By operating this handwheel, the block *Y* travels in the slot to which it is fitted, thus moving the link *X* and causing the tool to travel in the desired direction.

Shall We Standardize Tapers?

THE following paragraphs conclude the expressions of opinion on the merits of various tapers. These statements are given with a view to crystallizing sentiment in favor of one particular type, suitable to all branches of the machine-tool industry. The first and second parts of the articles were published April 13, and April 20, respectively.

No. 40. It would seem to us that with the thousands, and even hundreds of thousands of machines and items already arranged for the tapers already in existence, the Morse more especially (with the exception of perhaps certain milling machines), that the change along the lines you suggest would be very confusing and expensive for all concerned, and we should question the advisability of considering any change. In our case, we probably do not have more than a dozen orders in a year for a taper differing from our regular Morse taper, and they are generally for the Brown & Sharpe taper. We think the same rule would apply to the Brown & Sharpe people in any application that might come to them to fit their machines differing from their own taper.

We should think it would be a very serious matter to consider after so many years of having an established taper, such as the Morse taper, to consider making any change. From our own standpoint you can understand it would be a very serious matter for us to consider, and we should hesitate about doing so.

No. 41. Inasmuch as there are several good standards, the most popular of which are probably Brown & Sharpe and the Morse, the bringing about of a single standard for tapers would naturally meet with opposition from some manufacturers and the many users who might feel that a single standard would cause them some inconvenience and expense. Most of the specifications received by us are for the Morse standard, although there are some for the Brown & Sharpe.

We shall be glad to co-operate with whatever policies the engineering societies may decide upon. At any rate, we wish you success and regardless of opposition, we feel that you are making a step in the right direction.

No. 42. The question brought up in your letter is one that we, too, would like very much to see settled, and we think there is no time like the present for accomplishing the standardization of tapers. We would say by all means the Morse taper, and would like very much to see all machine tool builders adopt it as a standard. In this same connection we might state that we have been trying to get tap manufacturers to standardize on the diameter of their taps for the past three years, but have been unsuccessful, and it is therefore necessary for us to make a different size collet for each different make of hand taps and for each size of tap that is made. We would welcome any standardization of these diameters by the various tap manufacturers.

No. 43. Our use of tapers is quite limited and practically confined to the purchase of tools with them. It would be a convenience, of course, to have one standard for many uses and we would welcome such uniformity.

No. 44. We can readily understand your purpose in raising this question, although it seems to us to be somewhat late in the day to standardize on tapers. If it was decided that a taper different from the one we now use should be adopted as standard, it would cause us no end of trouble. We have 10,000 machines out using the taper that we have considered as standard. To change over all new machines to another taper, and have two different types of tapers, requiring two different sets of spindles for repairs, would lead to considerable difficulty and confusion. Should we on occasions send the wrong taper, considerable expense would have to be incurred, as our men would be obliged to go to the customer's plant and straighten the trouble out.

If the taper in the spindle of our headstock does not happen to fit, a demonstrator may have to travel several hundred miles to help the customer decide why it does not fit.

We make a taper hole in the headstock and footstock spindles because we want to have a certain condition of proper fit and support for the centers of these two heads. A Jarno taper has been selected because the formula determining the size of the taper is an easy one to remember and follow, and because it has just the right amount of taper to make the centers fit with the proper degree of tightness.

No. 45. This company has for many years used and advocated the Jarno taper for the spindles of both milling machines and lathes. We have believed, and still believe, that the Jarno taper is by far the most desirable among those commonly used as standard.

However, we recognize the desirability of uniformity of practice among manufacturers, and for the sake of uniformity we would be willing to consider the adoption of other standard tapers. In fact, we are already equipping some of our milling machine spindles with Brown & Sharpe tapers and are seriously considering the matter of equipping some of our lathe spindles with Morse tapers.

No. 46. There can hardly be a doubt as to the Morse taper being best for machine tool use. Nearly, if not all small tools, drills, etc., have the Morse taper—it drives out easier. We feel sure that Morse is "IT" and we would sure like to see it made standard.

No. 47. We believe a standard taper for machine tools would be a very good thing. We have always used the Morse system and it is standard for all drilling machines so far as we know. Regarding the other systems we have not used them enough to be able to intelligently discuss them.

Uses Jarno, and Modifications

No. 48. At the present time there is considerable controversy and difference of opinion, in our own organization, as to the proper standard taper to be used in engine lathe spindles, the question being whether we should finally standardize on Morse tapers or a modified Jarno.

We are all fully conversant with the fact that Morse tapers are used in vertical drilling machines, this being the standard adopted, and that in general a standard has also been adopted for milling machines. The fact remains, however, that there are various types of tapers used in engine lathes and it seems to be the opinion of some that it would be much better to adopt a taper which does not conform to the taper of drill shanks, thereby positively eliminating the possibility of using our tailstocks for drilling purposes.

Every good mechanic appreciates the fact that the tapers of the head and tail spindles are very essential parts of the machine and should not by any chance be bruised or abused in any way by inserting shanks with tangs similar to those used on drills. However, in order to use a Jarno taper we have considered modifying the length, as there is no doubt that the general feeling exists that the Jarno taper is rather long.

We therefore have considered using a Jarno taper with the formula: No. of taper $= D$ (large diam.) $+ 8$; length $= 2D + 1.75$ in.; small end $= D - 0.05L$, with the hole relieved $\frac{1}{32}$ in. back of the taper. Where the customer insists on using a Morse or Brown & Sharpe taper a sleeve may be furnished having a modified Jarno taper on the outside and a Morse or Brown & Sharpe taper on the inside.

There is a still further advantage in using a modified Jarno taper in that the practice today calls for large holes through the head spindle, which by investigation, shows that they vary according to the size of the lathe in fractions of an inch, as per example, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{1}{2}$, $1\frac{5}{8}$, $1\frac{3}{4}$, etc.

By referring to the Morse taper table, it will be noted that the small end of the taper varies by quarters, therefore it will readily be seen that by using Morse tapers it becomes necessary to use adapters which introduce a second joint or fitting, or to lose approximately one-half the

length of the bearing on the taper should they eliminate the adapter. By using the modified Jarno, the small end will vary in diameter according to the size in approximately one-eighth of an inch, and, therefore, lends itself admirably to the work.

We would certainly appreciate having a standard established and we can see no reason why such a standard should not be adopted by all lathe builders throughout the country.

No. 49. We feel that it would be almost as bad a proposition to change our standard—namely, Morse taper to either the Jarno or Brown & Sharpe, as it would be to change our system of measurement to metric. While it could probably be done, if spread over a long period of time, we feel that without question, our customers would be to a great extent still asking us to manufacture machines with the present standards. This would be on account of the fact that they have thousands of dollars tied up not only in drills but special tools, collets and chucks. To attempt to change, or to attempt to use several different tapers, would cause confusion and would add complication to an already complicated system. Without doubt, it would be ideal for a new plant to be able to interchange arbors, drills, chucks, etc., between milling machines, lathes and drilling machines. It would, however, be a hardship to ask plants already established to carry the additional equipment necessary until their present equipment has become obsolete, which—in many instances—might prove to be thirty or forty years.

A Study of Tapers

No. 50. We are of the opinion that none of the existing tapers are correct in theory and design and that none of them should be adopted as a standard taper for machine tool builders. We feel that there should be two standard tapers; that a taper 5/8 in. per foot should be adopted for drills, and drill presses; and a taper of ½ in. per foot for all milling machines and milling machine tools. Then, too, the taper shanks now in use are much longer than necessary. The lengths of the tapers were designed at a period when taper holes were finished by hand; now, however, taper holes, as well as taper shanks, are ground to size. The resulting fit is as perfect, theoretically at least, as human ingenuity can make it. In our opinion taper shanks two-thirds of their present length would be sufficient. This is particularly true of the larger size of tapers.

To be more specific, the Brown & Sharpe tapers, if made with a taper of 0.500 in. per foot, might be adopted for all milling operations with the exception that the No. 6 and No. 8 tapers could be entirely eliminated as they are seldom used. There also is no practical reason for having two No. 9 tapers and two No. 10 tapers. As to the lengths for these tapers we would suggest the following:

Nos. 1 to No. 5 could be adopted as they are; No. 7 should be 2½ in. in length; No. 9 should be 3 in. in length; No. 10 should be 3½ in. in length; No. 11 should be 4 in. in length; all sizes above No. 12 should be 4½ in. in length.

The Morse tapers, if made uniformly 0.625 in. to the foot, might be adopted for all drill operations with the exception that the lengths should be as follows:

No. 0, 1½ in. long; No. 1, 1¾ in. long; No. 2, 2 in. long; No. 3, 2½ in. long; No. 4, 3 in long; No. 5, 3½ in. long; No. 6 and larger, 4 in. long.

While firmly believing that the adoption of some one standard would be most beneficial to the machine builders, as well as to the users, we are of the opinion that it will be impossible to accomplish anything in this direction. An attempt to adopt a standard along the above or similar lines, would in our opinion result in adding another system of tapers to those already existing, but would not supplant any of them. Even if some one system could be devised that would meet with the approval of all machine tool builders, it would require a long period of years and constant striving to secure the universal adoption of the system.

Wants Standard Spindle Noses Too

No. 51. Our superintendent suggests that all Morse tapers should be 5/8 in. to the foot instead of random tapers, as is the case at present with the different size tapers. All Brown & Sharpe tapers should be ½ in. to the foot if both tapers are to be retained. If a single standard is to be adopted, that standard should be either one of the above, or one of about 9/16 to the foot. It would simplify matters considerably if one standard taper were to be used.

Another thing to which you may call attention in the manufacture of machine tools is the standardization of certain threads and parts for different machines. For instance on the spindle nose of a lathe or a milling machine, a certain standard should be maintained for each size lathe so that the purchaser of lathes could use the same chuck on all 16-in. lathes, and the same chuck on all the 20-in., etc. At the present time every manufacturer places his own idea of the number of threads to the inch on the nose of the spindle of both the lathe and the milling machine, and consequently the purchaser of the machine must have a large supply of chucks on hand to fit all different makes of lathes.

No. 52. As an engineer the problem that presents itself is to standardize, if possible, upon one kind of taper. From the standpoint of the shop the problem is to utilize all of the tools and equipment which they now have. This shop uses both Brown & Sharpe and Morse tapers. We have no machines with the Jarno taper. The latter is very convenient because of the ease with which it may be figured, but from practical experience its limited application to various machine tools, in so far as this shop is concerned, would suggest its entire elimination.

As to the other two tapers, the Morse so far predominates in numbers over the Brown & Sharpe that I would suggest it be used exclusively, if either of the two are to be made the standard. This, of course, is merely the reflection of the practice of one shop. Practically, I question seriously whether any change could be made for a considerable number of years in any shop, but I do feel that new equipment using one or the other of the two tapers would help in the long run in the matter of economy in production in this country.

Jarno Seems Best, But—

No. 53. Undoubtedly, the Jarno taper has advantages which do not appear in the others and we should say of the three mentioned that this one would be the best if we could have but one. We have, however, so much machinery and so many small tools tied up to the other two systems that it looks like a rather hopeless task to attempt to make any very radical change. We will be satisfied to use Brown & Sharpe tapers for our milling tools and Morse tapers on our drill presses, although it would be very nice if the drills could be used in the milling machines and, occasionally, if an end mill could be inserted in a drill press, which would be the case if the same taper were used for everything.

If a standard is to be gradually adopted, it looks as if the Jarno would be the best thing to aim for, although we cannot just now see where it will be able to get a substantial foothold which will be necessary before it can compete with either of the other two as a universal standard.

No. 54. In connection with our line of drilling machines, we furnish spindles with No. 2 Morse taper hole and do not recall ever having a request for machines with any other taper. For milling machines, we have adopted a Brown & Sharpe taper for the hole in the spindle and this has been generally satisfactory.

There is no doubt, however, that the adoption of a standard taper would have a great many advantages. Just what this taper should be, however, ,should be decided by wiser heads than ours.

No. 55. I feel it is extremely unfortunate that various tapers should be employed in the production of machine tools, and on the face of it, it would seem to me that there would be no reason why a standard taper could not have been utilized in place of the various tapers which are now employed. The Jarno taper appeals to me as being the most simplified type of taper that could be employed, and if we should at any time develop a line of grinding machines, you can rest assured that the Jarno taper will be the one used in our designs.

No. 56. We are using more of the Morse tapers than the

Brown & Sharpe or Jarno. As a matter of choice, we favor Morse only because it seems to be more universal in our shop. We are in hearty accord with the adoption of a single standard in this connection because of the expense and trouble found in maintaining two or three tapers in the shop.

Generally Ends in Discussion

No. 57. This question has been discussed many times, and it generally ends there. We have frequently been applied to on the subject of drill shank tapers, and have stated our own practice. We decided, probably in the sixties or earlier, that the $\frac{5}{8}$-in. taper per foot was too small for satisfactory use on account of its tendency to wedge. A taper of $\frac{3}{4}$ in. per foot was found to be better, and we adopted it for lathe centers and drills. We also found that driving by a tang on the small end of the shank was very unsatisfactory and that tangs were frequently broken off, thus ruining the drill. We therefore adopted the plan of keyseating drill shanks and provided drill chucks with a long parallel key or spline for driving. This construction has proved to be eminently satisfactory. We never break a shank. While many people have conceded the superiority of our standard, comparatively few use it, and drills thus made cannot be obtained from stock.

No. 58. We agree with you that it is emphatically important that we should have a single standard. The Morse taper seems to be very satisfactory for drills, and as that taper has been in existence a long time, we do not see any reason why the same taper could not be used in lathe spindle and other machine tools where a taper in the spindle is required.

A number of years ago the writer was appointed as a committee of one to look up and endeavor to standardize electric motors for machine tools. His correspondence with the various manufacturers of electric motors was very interesting. Each manufacturer acknowledged that it would be an excellent idea to have electric motors standardized, but each manufacturer wanted all the other manufacturers to come to his standard. We hope that the standardization of tapers for spindles may be brought about.

Romances of Metal Working—The Legend of Rudolph of Nuernberg

By H. H. Manchester

The tradition of Rudolf of Nuernberg was narrated by Conrad Celtes in his description of the city of Nuernberg, about 1491.

From this story Rudolf of Nuernberg was long considered the inventor of wire drawing in the 14th century, but we know that the invention had been made several centuries before. As a matter of fact, the story itself emphasizes his work as involving great improvements, rather than the original invention. The legend may be retold as follows:

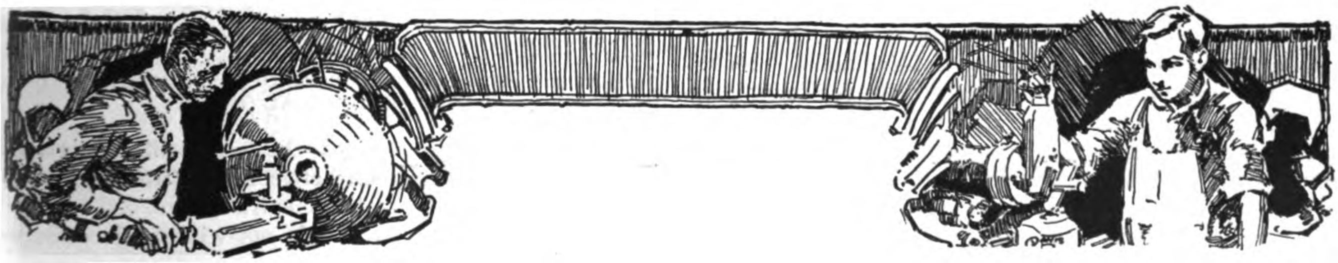
Rudolf and his son were wire drawers in Nuernberg in the 14th century. At that time there was a great demand for heavy iron wire to be used in chain armor, and for fine wire to be used in winding with yarn for purposes of embroidery. In those days the process of making wire was either the ancient one of cutting a thin strip of metal and hammering it round, or else of drawing the wire through the steel draw plate by main strength with the aid of pincers to grasp the wire, and perhaps a swinging seat to allow a longer and easier pull. Of course, this was hard work, and Rudolf discovered that it could be lightened by the use of wheels. Whether this was the winding of a wire on a drum, as it was represented in pictures early in the 15th century, or whether Rudolf actually discovered how to apply water power to wire drawing, which is not represented in pictures for another century, is uncertain, but the greater likelihood is that his improvement was the use of drums for winding the wire through the draw plate.

At all events, his process was so much easier and faster that he soon acquired considerable wealth. He

WIRE DRAWING IN OLDEN TIMES

tried to keep his process secret, and was in a measure successful, but he could not disguise his growing prosperity. As a consequence, the other members of the guild began to suspect that he was concealing craft secrets from them, and getting hold of his son succeeded in so wheedling and bribing him that he eventually disclosed the entire secret.

This so enraged Rudolf that he flew at his son in an attempt to kill him, but he managed to escape into exile, the outcome of which was to extend the knowledge of wire drawing still further.



A Chart to Aid the Figuring of Helical Gears

Relation Between the Elements of Helical Gears—Method of Constructing the "Spiral' Gear Protractor—More Rapid Solution of Problems in Helical Gearing

By W. C. STEUART

Chief Engineer, Detrick & Harvey Plant, Bethlehem Steel Co.

I AM GOING to call them spiral, instead of helical gears for the same reason that most people say "aren't" or "ain't" for "are not"; I do not want to appear priggish. I shall call them "Spiral Gears," for that is the term which most of us use.

When I was a cub draftsman, some eighteen or nineteen years ago, spiral gears were regarded among us

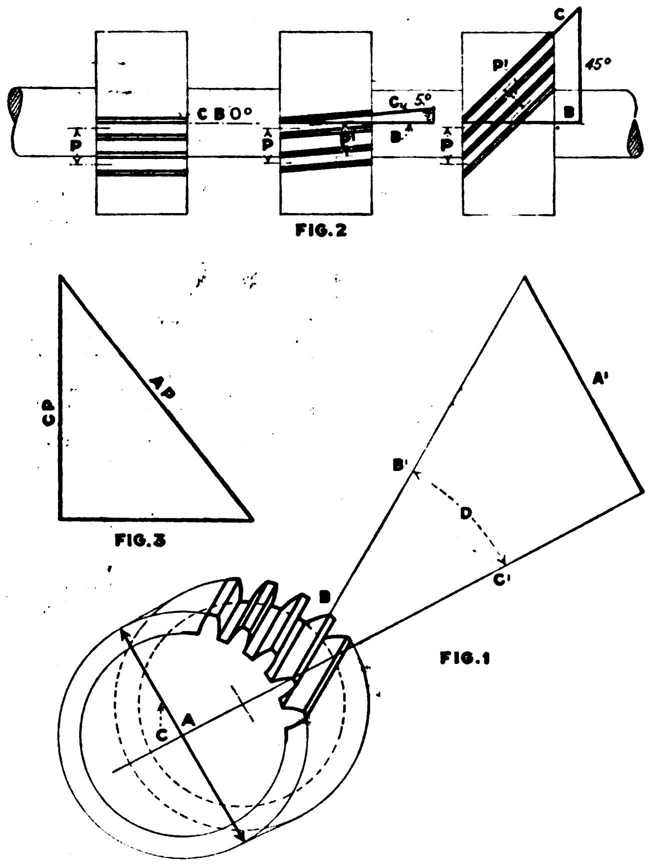


FIG. 1. ELEMENTS OF A HELICAL GEAR. FIG. 2. COMPARISON OF SPUR AND HELICAL GEARS. FIG. 3. RELATION BETWEEN PITCHES

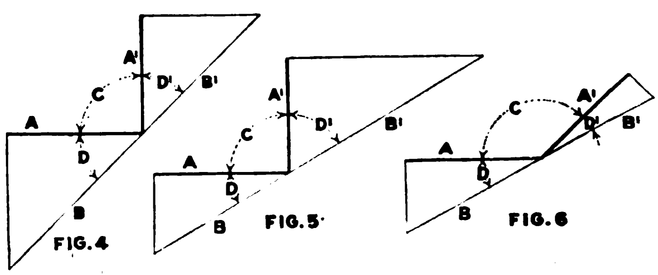
as a sort of dark and bloody mystery. Even the "Chief" himself did not know how to figure them, and if a pair of spiral gears were wanted to fit into the design of a machine, we would send the center dimensions, clearances, etc., to some gear manufacturer who would design a pair of gears to suit and send us a special cutter for cutting them. As for cutting them with standard spur-gear cutters, we did not know such a thing was possible. We have all learned a few things since our cub days, however, besides knowing better than to go out into the shop to borrow "a left-handed monkey wrench" or a "lifting and striking tool" for some bald-headed and bespectacled senior who appeared to our admiring eyes to have a more profound knowledge of engineering than Professor Sweet.

The not over-abundant knowledge I have since acquired on the subject of spiral gears, I propose to set forth in this article, together with a description of a spiral-gear protractor which any draftsman may make for himself, and which he will find a decided help in designing. I am going to write this article with the supposition that the reader knows nothing about spiral gears beyond having seen them, so that it will be as intelligible as possible to all of my readers.

If the reader will get the idea firmly fixed in his mind that a spiral gear is nothing but a short section of a multiple-thread screw, or of a worm, and that the driver and the driven bear the same relation to each other as a worm and wheel, he will have made quite a step toward an understanding of the subject. If he will further bear in mind that, owing to the great lead and the similarity of form between the driver and the driven, the worm may become the wheel and that, consequently, either one of a pair may be the driver, he will have gone still another step.

Just as we may theoretically unwind the thread of a screw and lay it out upon our drawing paper as a triangle whose base is the circumference of the screw, its altitude the lead and the angle of the hypothenuse the angle of the thread, so we may lay out a spiral gear and apply to it the same terms. Thus, a spiral gear having a tooth angle of 45 deg. will have a lead exactly equal to its circumference. A glance at Fig. 1 may help those to whom this is not entirely clear. Here the diameter *C* is spread out, as it were, into the circumference and becomes the base of the triangle, or *C'*. The line of the tooth *B* is extended on the tooth angle *D* and becomes the hypothenuse *B'*, while upon completing the triangle, *A'* becomes the lead. In order to show the relation between spur and spiral gears, there is shown in Fig. 2 a diagrammatic representation of spur and spiral gears each having but two teeth, the others being cut away to avoid confusion.

A little consideration of the diagram will show that for a gear of a given number of teeth, as the angle of the teeth departs more and more from the right angle of a spur-gear tooth, one of two things must happen: either the diameter of the gear must be increased, or the pitch and size of the teeth must be decreased, in



FIGS. 4 TO 6. GRAPHIC METHOD OF REPRESENTING MATING HELICAL GEARS

order to keep the gear of the same pitch diameter. Fig. 3 shows the relation between the circular and the actual pitches of the teeth of spiral gears.

It will be seen that, if we do not wish to increase the

pitch diameter of our gear, we must have cutters that will cut teeth smaller than standard pitch in proportion to the increase in angle. This would mean that for every change in tooth angle, be it only by one degree, we would have to use a different cutter, and no two gears of different angle, even though they had the same number of teeth, would have teeth of exactly the same size. If, instead of this, we use a standard spur-gear cutter, all gears of the same pitch will have the same size teeth, like spur gears, but their pitch diameters will increase as the angle of their teeth departs from the zero angle of a spur gear. Now, as good workable spiral gears may be cut with spur-gear cutters, it follows that this is the most economical and satisfactory method to follow in designing them.

No special cutters whatever are required, while with the other system a special cutter is necessary for every gear. With the one system, a shop with the usual complement of spur-gear cutters is prepared to produce any gear that may be required; with the other system such an infinite number of cutters would be needed that it would be out of the question to carry them all on hand.

In designing a pair of spiral gears, the following factors are either fixed or known: The distance between centers, the ratio, the pitch, and the face width. In addition to the above, the maximum diameters are frequently set, and since these diameters may be varied at will, as has been already explained, we may make them to suit clearance conditions, and make the gear with the least number of teeth to have the largest pitch diameter.

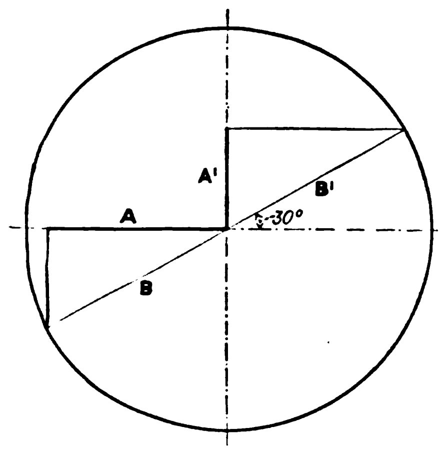


FIG.7

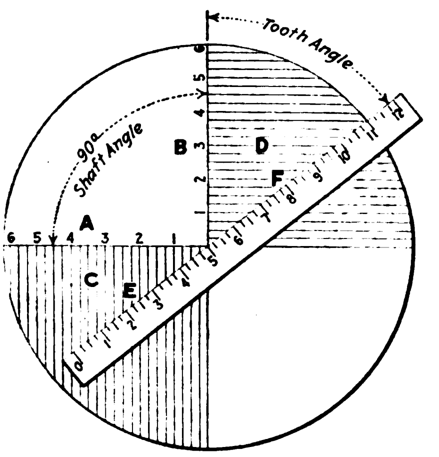


FIG.8

FIG. 7. LAYING OUT GEAR DIMENSIONS. FIG. 8. SIMPLE CHART FOR DETERMINING GEAR DIMENSIONS

Our unknown quantities are: The pitch diameters, the number of teeth, and the tooth angles. Here we have three unknown quantities at once, and since they are all interdependent, the slightest variation in one will vary the other two. So how are we to start at our figuring? We are left to make a wild guess, and then flounder around by cut-and-try figuring until we hit upon the right combination.

Now, we may call the graphic method to our aid and obtain a close approximation to our requirements, so that very little figuring will be required.

Referring to Figs. 4, 5 and 6, we have in each, two triangles representing two spiral gears in the manner already explained, the angle C being the shaft angle, which in Figs. 4 and 5 is 90 deg., and in Fig. 6 is only about 45 deg. from two right-angles, at which point the gears would become spur gears. A and A' represent the pitch diameters of two spur gears having the same numbers of teeth and pitch and, consequently, the same ratio as the spiral gears. B and B' represent the respective pitch diameters of the spirals themselves, and D and D' are the tooth angles. In Fig. 4 the tooth angles are 45 deg. and the pitch diameters of the spiral gears bear the same proportion to each other as those of the equivalent spur gears.

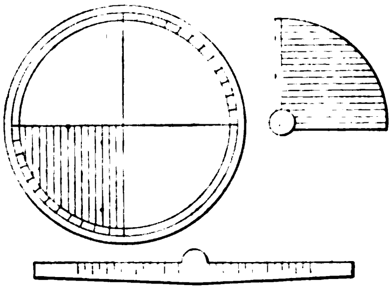


FIG. 9. PARTS FOR CHART

In Fig. 5 the angle is changed to about 30 deg. with the result that, while the number of teeth, ratio and, consequently, the equivalent spur-gear diameters remain unchanged, the pitch diameters of the spirals are so altered that not only is the center distance greatly increased, but the ratio of the pitch diameters to one another is so changed that the gear with the smaller number of teeth now has the greater pitch diameter. This, however, in no way alters the speed ratio of the gears, since we have not changed the number of teeth. It should be borne in mind, therefore, that the number of teeth in spiral gears and not the pitch diameters fixes the speed ratio, and this is what gives spirals their great flexibility.

In Fig. 6 we still have the same number of teeth, that is, the same equivalent spur-gear ratio, with the same tooth angle in the larger gear; but the shaft angle has been changed to 45 deg., so that the smaller gear, or rather the gear with the least number of teeth is now indeed the smaller gear.

Spiral gears may be laid out by this method and their various proportions determined approximately, the accuracy depending entirely upon the care with which the laying out is done, but the graphic method does not solve the problem of quickly finding the unknown quantities any better than the figuring method, for the one known quantity in our diagram is the combined lengths B and B' representing the combined pitch diameters of the two spirals, or twice the center distance. We know the ratio between the spiral gears, and consequently the ratio between the equivalent spur gears, but we do not know the exact sizes that will produce spiral gears to fit into our center distance.

It was to solve this problem of quickly finding the unknown quantities by a method of easily and rapidly varying them graphically that the writer devised an operating chart which he calls the spiral gear protractor, later described. To make our triangle elastic, as it were, was the problem. By operating the protractor or chart, we may easily and quickly vary all of the unknown quantities entering into the problem and obtain a close approximation to the desired solution, such as could only be found by repeatedly figuring and re-figuring. This approximation may be found in two

or three minutes at most, and then the problem need only be figured once or twice to determine the exact dimensions. It is safe to say that from a half hour to an hour of figuring may be saved on each problem.

Let us inclose our two triangles within a circle, as in Fig. 7, and we will have made the first step. Now refer to Fig. 8. Here the circle has inscribed therein a right angle, which represents the bases of our two triangles in their proper relation to one another so long as the shaft angle remains 90 deg. Now, if we further divide the bases of our two angles into any convenient number of fractions of an inch, and draw from these divisions lines at right-angles to the bases, it is obvious that we have two sides, respectively, of any two right-angle triangles, being limited only by the size of our circle and the value we choose to assign to our divisions. Now, if we lay a scale across our diagram, with the edge passing through the center of the circle, we will complete our two triangles, with the angles and dimensions varying according to the position of the scale.

For example, suppose that we were laying out 8-diametral pitch spirals. Our tooth angle would be the angle of the scale as measured with a protractor; *E* measured on the scale would be 5 in., the pitch diameter of one of the spirals; and *F*, $9\frac{3}{4} - 5 = 4\frac{3}{4}$ in. would be the pitch diameter of the other spiral. Following *C* up from *E* we get on *A* at 4 in., the diameter of an equivalent spur gear, and consequently the spiral gear *E* would have 32 teeth. Employing the same process with *F*, we get 3 in., or 24 teeth.

After using the charts, as in Fig. 8, several improvements suggested themselves. It was seen that it would be an advantage to have the scale rotate about the center of the card, and also to have it graduated so as to read from the center towards both ends. It was further seen that, if one of the two quadrants was pivoted at the center, so as to permit its angle with the other quadrant to be altered, the device could be used for gears having shaft angles from 90 deg. down to parallel or spur gears. The device therefore resolved itself into the form shown in Fig. 9, the circular card, the quadrant and the scale. The complete protractor is shown in Fig. 10. The illustration was prepared from one that is $9\frac{1}{4}$ inches in diameter.

In Fig. 11 is shown a diagram of the protractor set to a shaft angle of 25 deg. and with the two triangles *ABF* and *A′B′F′* marked in heavy lines for the sake of clearness. The quadrant *D* is set to the 25-deg. shaft angle, and the scale is reading to tooth angles of about 32 and 58 degrees.

Construction of Protractor

It will be observed that the working protractor shown in Fig. 10 has a half circle instead of a quadrant. The reason for this is that when the shaft angles approach parallel and the tooth angles are very rank—that is, when one of the gears is almost a spur gear—it will be found that the scale will swing past the 90-deg. line of the swinging sector, and it is necessary to have another quadrant in which to read the result. It will be further observed that the quadrant commonly used is the one in which the answer to our problem is read. Here we read on the margin "THIS SIDE, SPIRALS OF SAME HAND"; and when the reading is in the other quadrant, it reads "THIS SIDE, SPIRALS OF OPPOSITE HAND." This means that after we pass a certain combination of shaft and tooth angles, our spirals, instead of both having their teeth cut to the same hand, one of them must be cut right-hand and the other left-hand. When spirals are used to drive parallel shafts, as in the case of some French lathe headstocks they are always cut right and left hand. The French arrange their lathe back gears so that the back-gear shaft and the spindle sleeve have each a right- and a left-hand spiral, thus neutralizing the thrust. Gears having shaft angles of 90 deg. are invariably of the same hand, and it is rarely that they become of opposite hands until the shaft angle becomes 60 deg. or less.

It should now be easy to understand the complete protractor, as shown in Fig. 10. The circular card *A*

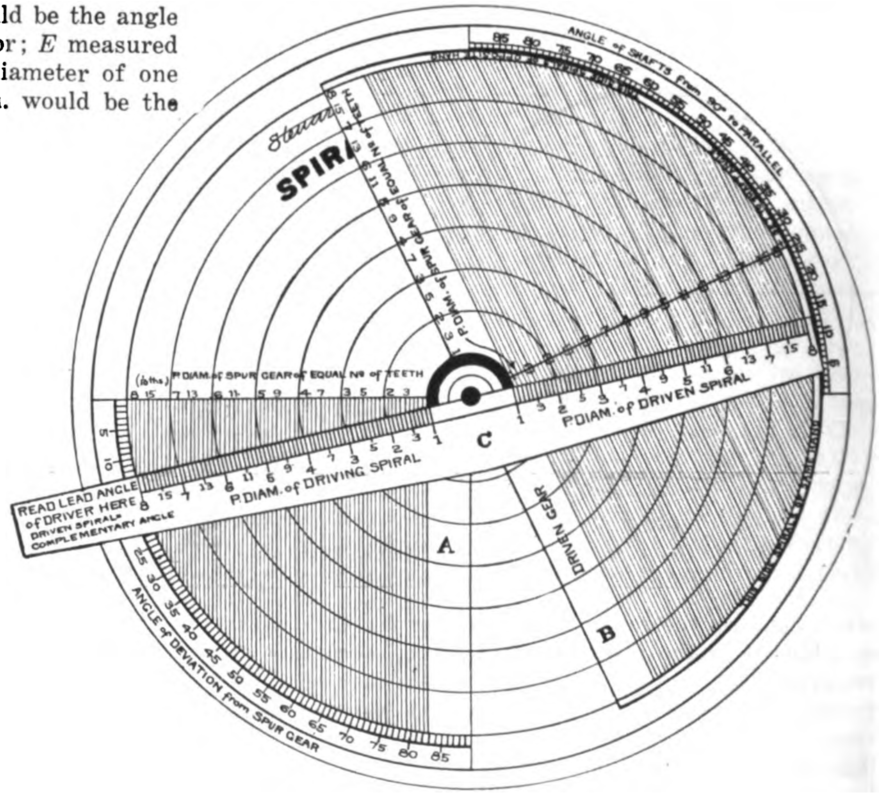


FIG. 10. THE "SPIRAL" GEAR PROTRACTOR

has two diametrically opposite quadrants, the lower left-hand one being graduated on the margin to degrees and marked "ANGLE OF DEVIATION FROM SPUR GEAR." It is also divided into the vertical lines which are figured for scales of half and quarter size, and marked "PITCH DIAMETER OF SPUR GEAR OF EQUAL NUMBER OF TEETH." This quadrant is used for reading the diameter, number of teeth and tooth angle of the driving spiral. The other quadrant is graduated in degrees only, and is used for setting the movable sector to the shaft angle, and is marked "ANGLE OF SHAFTS FROM 90 DEG. TO PARALLEL." The tooth angle of the driven gear is always the complementary angle of the driver, allowing for the shaft angle.

The movable sector *B* has two quadrants divided with vertical lines like the circular card, and marked in the same way. It has the marginal directions with regard

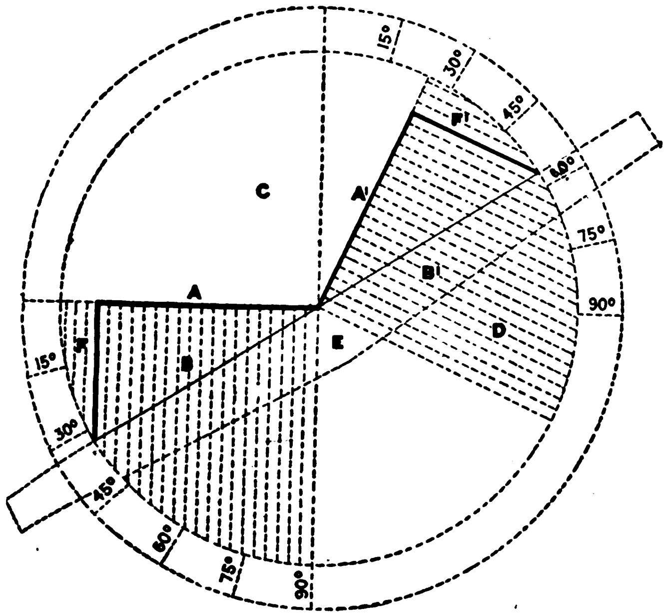


FIG. 11. READING THE PROTRACTOR

to the hand of the spirals, as already explained. It is used, of course, for the driven gear.

The swinging scale is graduated in half and quarter size to match the quadrants, and reads from the center toward both ends. On its scale we read the pitch diameters of our spiral gears, and from its angular position we read the tooth angles. It is marked on the right-hand end, "PITCH DIAMETER OF DRIVEN SPIRAL," and on the left-hand end, "PITCH DIAMETER OF DRIVING SPIRAL." On the extreme left-

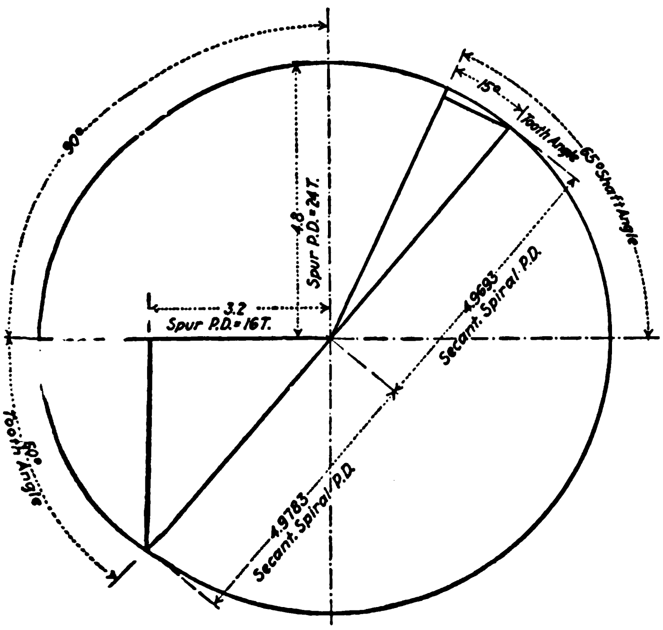


FIG. 12. ACCURATE SOLUTION OF A GEAR PROBLEM

hand end of the scale is marked, "READ LEAD ANGLE OF DRIVER HERE." "DRIVEN SPIRAL = COMPLEMENTARY ANGLE."

Let us conclude with a concrete example of the use of the protractor. Suppose we have two shafts whose centers are 5 in. apart and set at an angle of 65 deg. from parallel. We desire to drive from one to the other with a pair of 5-diametral pitch spiral gears having a ratio of 1 to 1½, but of equal diameters. It has already been explained that this is possible by varying the tooth angles.

Set the central dividing line of the sector *B*, marked "SET TO SHAFT ANGLE," to the 65-deg. angle, as indicated on the margin of the circular card *A*. As previously explained, the tangent lines on card *A* and sector *B* represent what our gear diameters would be if their shafts and teeth were parallel, in other words, if they were spur gears. The actual diameters increase as the tooth angles depart from the square line of a spur gear tooth. The spiral gear pitch diameters will be found on rule *C*.

We now proceed to find the desired tooth angle, placing the scale *C* in various positions, until its angle is such that two equal diameters of 5 in., representing the necessary pitch diameters of the two spirals, as marked on this scale, coincide with the tangent lines referred to above, originating from two spur-gear diameters having a ratio of 1 to 1½.

We will find that when the scale *C* is set to an angle of 50 deg., 5 in. on the left-hand scale coincides with 3.2 in. on the card *A*, and 5 in. on the right-hand scale coincides with 4.8 in. on sector *B*. Therefore, our driving gear will be approximately 3.2 in. in pitch diameter, and its tooth angle 50 deg., while the driven gear will be 4.8 in. in pitch diameter and its tooth angle 65 — 50 = 15 degrees.

The precise angles may now be determined by a little trigonometry, without the repeated trials that would be necessary if we had to depend entirely on calculation. To obtain the exact dimensions of the spiral gears, construct a diagram as shown in Fig. 12. Our shaft angle is already fixed, the tooth angles have been determined on the protractor and it only remains to ascertain the exact pitch diameters. To any one familiar with trigonometry, it will be plain that our spiral pitch diameters are the hypothenuses of our two angles whose bases are the spur pitch diameters, and therefore we have only to multiply these base dimensions by the secants of the tooth angles or use the more usual formula: $1 \div \text{cosine} = \text{secant}$.

Therefore, since the spur P.D. ÷ cosin. 50° = spiral P.D., $3.2 \div 0.64279 = 4.9783$ in. for the driver.

And, the spur P.D. ÷ cosin. 15, or $4.8 \div 0.96593 = 4.9693$, spiral P.D. of the driven.

Our centers will then be:

$$\frac{4.9783 \times 4.969}{32} = 4.9738 \text{ in.}$$

This is as close as it is possible to get to the desired center distance of 5 in. without changing the relative spiral pitch diameters; that is, making them unequal, or by cutting the spirals a little over size, which is perfectly practicable.

It has already been explained that no special cutters are required, but that standard spur-gear cutters may be used. We cannot select these by the usual method, i.e., by the number of teeth of our gear, but the following formula must be used: Divide the number of teeth in the gear by the Sin^3 of the tooth angle, and the product will be the number of teeth for which to select the cutter.

Something for Service Station Men to Think About

Causes of Service Cost to the Producer—Component Parts too High—Parts Needed for Repairs Take Precedence Over Parts for Production

BY NORVAL A. HAWKINS
Director of Sales Section, General Motors Corporation

TODAY the automotive manufacturing industry in the United States represents an investment of over two billions of dollars. There are about 700,000 individuals directly engaged in the manufacture of motor vehicles, parts and accessories, and in addition there are more than half this number directly identified with the retail sales and service end of the business, giving a total of approximately one million people who are making a living for themselves and their families directly from this, the second largest industry in the world.

There are five causes and *only* five causes of service cost to the producer, or the car owner or both. They are as follows:

(1) Faulty engineering design; (2) faulty production, including careless workmanship, and faulty material or both; (3) incompetence on the part of the service repair men; (4) incompetence on the part of the user; (5) the wear and tear of normal use.

The first, second and third causes for service expense are directly within the control of the manufacturer, and we as service managers should make it our business to take some interest in the fifth cause.

Service should properly begin with the design of the car—in fact it should begin with the very conception of a product and it should be projected through the engineering, manufacturing and marketing process, assuming an ever increasing importance after the product is in the hands of the user and until the time that it is ready for the discard through legitimate and honest wear—*after having given an adequate return on the customer's investment.*

THREE KINDS OF SERVICE

Service, in terms of our industry, divides itself into three classifications:

1. Parts manufacture and distribution.
2. Mechanical repair work.
3. Moral or psychological service.

The reason that many dealers have failed to make a profit on their parts business is because we fellows back at the factories have *guessed* at what they needed rather than making it our business to *know* what they were going to require. The result has been reflected in great volumes of telegraphic orders, express shipments and unnecessary expense to the car owner.

Within our own organization we found through a careful analysis that from 20 to 35 per cent of all repair parts orders during the first six months of 1921, were telegraphic and that almost 50 per cent of our parts shipments were going forward by express or parcel post as rush orders with a consequent high percentage of errors.

Scientific anticipation of repair parts requirements and the distribution of parts on a wholesale basis are necessarily the forerunners of an efficient unit package system and we've all got to come to it.

We have no right to penalize our customers for our own inefficiencies incident to the repeated physical handling of our repair parts. We have not discharged our obligations to the car owner, we have not met our responsibility until we get these parts to him at the right price.

We recently made an investigation on a number of cars of representative makes to determine the relation between aggregate repair parts prices and the list prices of the finished products. The ratio ran from one and one-half to two.

DISCREPANCY IN COSTS OF PARTS AND ASSEMBLED CAR

Why should it be necessary to get twice as much for a disassembled car as you get for an assembled car? The complete car has a great deal more mechanical labor chargeable to it. There is always an unavoidable breakage of material incidental to the assembly process. It is supposed to require a more expensive type of salesman to sell a finished car and it is usually necessary to demonstrate it before consummating a sale.

It surprises me to learn that a number of companies have even discontinued the practice of supplying owners with parts catalogs.

We, of the automobile fraternity do not hesitate to spend $7,500 in the Big Weekly to call our product to the attention of the buyer and if Mr. Buyer answers the ad, we send him eighteen form letters, six folders, a dollar and a half catalog and a liveried chauffeur to take him for a ride in the park—then after he buys the car we refuse point blank to give him a parts catalog and some of us even go so far as to attempt to charge him for it.

I am in favor of lower and uniform prices on repair parts but please don't misunderstand me. I am not at all in sympathy with those of you who do not think that a service department should be conducted for a profit and if you want to earn the status with your respective organizations to which you are entitled, if you want to be looked upon as producers instead of parasites—if you want to be business executives instead of clerks—you've got to look at it just as I do. If you are ambitious for recognition in an executive way, you MUST be able to show your results on the right side of the ledger.

We have just inaugurated a policy within General Motors, handed down from the president through the executive committee, that provides for service parts requirements being given precedence over production requirements, first, last and always—irrespective of the new car orders on file—and without consideration for any temporary financial loss.

We have arrived at the very sound conclusion that keeping the old cars running is of far greater and more lasting importance than the matter of getting the new cars sold.

The old car owner must be given first consideration if

Extracts from a talk before Service Managers' Meeting of National Automobile Chamber of Commerce.

we expect to get new car owners. The repair parts phase of the industry must be conducted for profits but these profits must come through greater efficiencies all along the line rather than by the maintenance of prohibitive repair parts prices.

It is my prediction that within three years every reputable repair shop in America will be operating on some form of flat rate system. Whether we like it or not, we've got to come to it and when we *do* come to it we'll be surprised at just how low our past efficiency has been.

In our *factories* we know just how long it takes to do a specific operation, and the exact cost of the material and labor involved, whereas on the other hand, our service stations refuse point blank to tell a man what a repair job is going to cost him and as a matter of fact, they seldom charge any two people the same amount for doing the same job.

To me the necessity for standardizing repair operations is so obvious and so simple of accomplishment that it makes me mad when I hear a service manager say that it is impractical in connection with his particular product.

I'd like someone here to tell me the difference between putting on a steering knuckle in a factory and in a service station insofar as the problem of cost analysis is concerned.

Moral or Psychological Service

And next we come to our third classification of service, namely, *moral* or *psychological service.*

In addition to the tangible repair parts distribution and mechanical phases of our service activity, there is this intangible moral phase.

Take the matter of keeping cars clean in a repair shop. A man may bring his car into your service station ever so dirty but this does not license you to turn it back to him in a still more untidy condition.

In the first place, the repair shop itself should be kept clean and there is no necessity for the mechanic to wear the same pair of overalls throughout the season without washing. A clean repair shop is one of the dealer's best advertisements.

A repair job should never have a *"finish"* tag put on it until the body interior has been dusted out and the steering wheel wiped off.

When the bill for a repair job runs over $15 I would say that the dealer should give the car a wash and a polish free of charge and he'll find it the best investment he ever made.

If I sent a coat to a tailor shop to have a button put on or a rip sewed up and the tailer spilled a can of machine oil on it or let his dog use it for a bed, I would raise the dickens and so would you, and yet every day cars are being turned out of our "authorized service" stations so greasy and mussy that after you've ridden around the next block you're a fit candidate for a Turkish bath.

Even our finest closed jobs are not immune—in fact, the average mechanic seems to fairly revel in the joys of disseminating grease and oil on a broadcloth interior—he may miss the universal joints, the transmission and the differential but the front cushion and the steering wheel—*N-E-V-E-R!!*

Manufacturers have made much progress during the past five years in the development of enclosed jobs with piano finish and luxurious appointments. The most painstaking care is used in the selection of the proper material for the cushions, carpets, curtains, etc., but the average garage mechanic on the other hand has not yet learned to appreciate the difference in fineness between a $10,000 limousine and a truck.

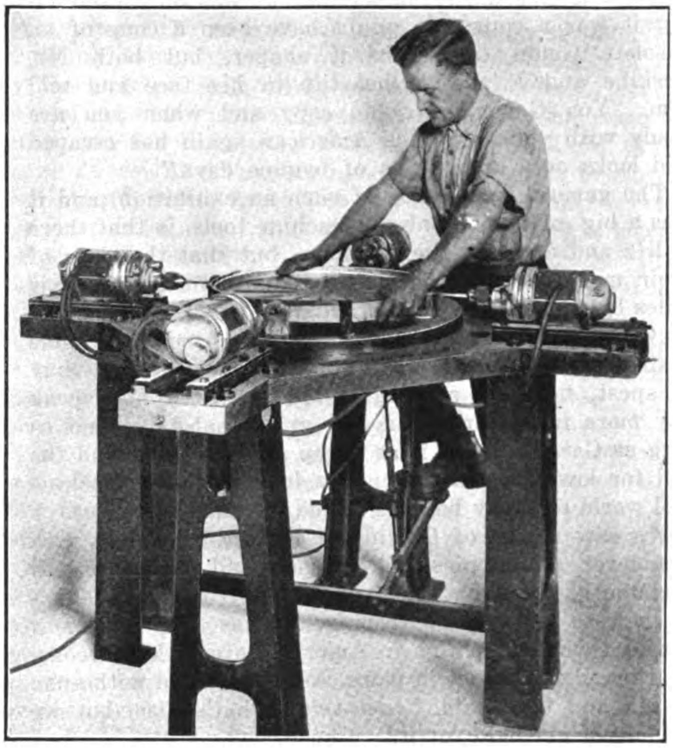
In the future, automobiles and the service that must inevitably follow will have to be sold and sold hard—our most valuable allies are the 9,000,000 car owners whose continued good-will rests largely in the hands of the service men.

It is to you men we must look for the greatest future development of the automotive industry as a whole—and remember that *"He profits most who serves best."*

Rapid Drilling of Barrel Covers

Special Correspondence

A sanitary barrel made from steel metal and intended for the holding of such materials as sugar and flour, required the drilling of four small holes in the periphery



MACHINE FOR DRILLING A BARREL COVER

of the head. Since rapid production of the heads was desired, the arrangement shown in the accompanying illustration was developed.

The machine consists chiefly of four ⅜-in., 220-volt, Black & Decker portable electric drills. The handles and the switch mechanisms of the drills are not used, the housings being mounted on slides resting on a heavy table. The slides are operated simultaneously by means of a pedal, so that all the drills can be fed to the work at the same time. The drill bits enter through jigs having hardened bushings, and a fixture is provided for holding the barrel head.

When operating the machine, the attendant merely places a barrel head in the fixture, and then presses his foot on the pedal to feed the drills through the work. There is a retaining ring on one side of the work-holding fixture to keep the head from rising, while the operator holds the other side so as to prevent vertical motion and vibration.

A Hollander's View of Leipzig Fair

By D. DeVries
Manager, R. S. Stokvis & Zonen

The writer is just back from Germany where he visited the Leipzig machine tool exhibition. It would be very instructive for an American to visit such an exhibition. If one to whom each machine is an old acquaintance, no matter what its changes in design, strolls along the various stands, his eye is caught here and there and he says, "Not bad, by Jove, the Americans have big competition."

Take, for instance, the stand of Raboma radial drills. Here is a big drill but if one compares it with a modern American machine he will say, "Well, that machine is an engineering problem to the workman. Too many ornaments. It needs a college graduate to handle it."

We had a talk with Samson, makers of vertical grinders of the Pratt & Whitney type. They also make a shaper which the manager pretended was a copy of a Gould & Eberhardt shaper, but he was only pretending it was a copy. It might have been a copy of an obsolete Gould & Eberhardt shaper, but both Mr. Peskine and I laughed heartily in his face and told him, "You Germans try to copy and when you are ready with your copy the American again has escaped and looks only upon it as of bygone days."

The general impression of such an exhibition, and it was a big exhibition only of machine tools, is that there is life and drive in the Germans, but that the class of their machines and the class of their workmanship is miles below the American standard. On the other hand they manufacture cheaply and today there is but one desire in the world, "Buy cheap, buy cheaper, buy cheapest, buy for nothing." Quality does not speak any more in Europe, it is the price that talks and as long as German labor is as cheap as it is today and the call for low prices as strong as it is now, the machine tool world of today belongs to the Germans.

We saw copies of Cincinnati milling machines with Wanderer and copies of Kearney and Trecker with Mammuth, but what poor copies they were. We explained to one of the representatives the treatment through which gears go in America before they become gears ready to be put in place, and he listened with open mouth and then said, "Just think, that's nice, but we would not get paid for it." Cheap, you see!

In lathes there was nothing special. A good German lathe sells for one-quarter, or less, of the price of an equivalent American tool.

The German workman works and produces today for five American cents an hour. He has to fight for weeks and weeks in order to get another two cents and that is why Germany is not able to buy. A few people are earning heaps of money, but because it is in paper marks they try to spend it as soon as they get it, so you see much luxury in Germany. Big dinners, filled hotels, wine and champagne and what surrounds it, but the greater percentage of the people live in poor condition. The splendor of the rich is displayed but the poor suffer in silence within the walls of their houses.

While America, England, France, Spain, Italy and smaller countries are struck with a depression worse than any living man can remember, there is a big boom in Germany. Most of the machine tool firms are sold out for six to eight months and everybody at this exhibition looked gay and prosperous. Everybody had booked big orders. They had their inland prices for Germany and export prices planned according to the rate of exchange, one scale for Holland, another for France and still another for England, all fixed by conventions and committees. It was noticeable how many Englishmen visited the exhibition willing to buy and buying. It was estimated that about 3,000 Dutchmen visited the show and there were many French, Belgians and Scandinavians, but few Swiss and hardly any Italians and Spaniards. A committee of the Russian Soviet visited the exhibition and we saw some Japanese and Chinese, but the great majority were the Germans themselves.

According to the present export organization which Germany has shaped for herself, machinery can only be exported at a fixed price, a price about twice as high as the domestic price but about half what the rest of the world asks. They have formed, so to say, a world of their own in which they all prosper and live on the rest of the world and one is forced to ask whether it is better to win a war or to lose it. At present the losers seem to be on top but common sense will say that such a thing cannot last forever and when the break comes it will be an awful one.

The present boom can only continue as long as the mark keeps on depreciating in value. The exchange today is about 250 marks for the dollar, so a little more and the mark has no value at all. What then? Then misery must come as it came gradually but with certainty in Austria and Russia, and another section will be added to that part of the world from which the rest can expect nothing for the happiness of the whole. The Germans do not deserve such a condition. They are a hard working, industrial nation who are doing their best to keep pace with the rest of the world. However, when it comes to a really excellent design and progressive ideas in the machine tool line, they lack initiative. They are too much out for success in another way than the Americans. If an American manufacturer cannot produce a thing for less than five thousand dollars, he will not offer it for less even if he gets no orders, but if a German cannot get five thousand dollars, he will try to get the order for four or for three or even for one thousand dollars, sacrificing everything for being booked well ahead with orders.

Our final impression of this visit to the Leipzig exhibition was that Germany is not killed at all, but keenly alive and that in the long run she will fit into her own place. That place, however, will not be the place the American machine tool builders are looking for, which is to be at the top in design and workmanship, in service and production.

Copy of a personal letter written to a friend in America and printed by permission.

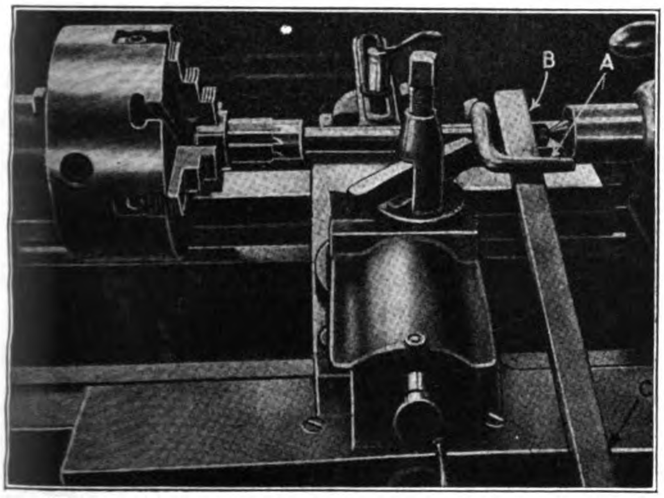
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Avoid Danger When Drilling in a Lathe —Discussion

By S. Kelly

The article on page 271 by Harry Senior, entitled "Avoid Danger When Drilling in a Lathe," covers a subject that has received a great deal of consideration in American Machinist and similar publications. Each writer usually suggests some modification of this dangerous and pernicious practice of drilling or reaming holes by means of a drill or reamer held upon the tail



THE WAY TO MAKE A DANGEROUS JOB SAFE

center and prevented from turning by a *single ended lever* consisting of lathe-dog and tool shank, steel bar, or "pine stick."

The use of such a lever in this manner tends to cause the end of the drill or reamer to rise and the greater the pull upon it the greater is the power exerted, due to the lifting effect of the lever, to force the end upward and off center.

The way to make the best of a bad situation is, as Mr. Senior describes, to fasten a dog to the reamer shank, allowing the tail to rest upon a tool, bar, or pine stick in the toolpost in such manner that the carriage is eased along with the feed of the tail spindle and thus prevents the reamer from moving forward sufficiently to allow it to jump off the center.

With one hand feeding up the tail spindle while with the other he tries to "ease" the carriage along so that the toolpost will always bear firmly against the dog, the machinist certainly has his hands full. Is it any wonder that there should be so many machinists with mained hands and fingers?

There is but one safe and sane way to perform such a job, and that is to use drills and reamers having standard taper shanks to fit into a socket, or sockets, in the tail spindle. By this method there is no danger when the tool breaks through the work.

Superintendents, foremen and factory inspectors should forbid the use of the dog and single end lever, even when used in conjunction with a "pine stick."

[This letter was submitted to Mr. Senior and his reply is printed herewith—Editor.]

Your correspondent did not read my letter understandingly. This may have been my own fault in that I did not make the operation entirely clear and to remedy such defect as well as to prevent further misunderstanding and make certain that I have mitigated to some extent the evils of what may be a really dangerous job, I have this time included an illustration.

There is no such thing as a "single-ended" lever. I need not enter into a discussion of the various classes of levers, for I am sure that all mechanics know that to be a lever at all a piece must have a weight to move (or resist), power applied to move it, and a fulcrum or point of resistance. Whether my pine stick is a lever of the first, second or third class depends upon the individual conception as to which points represent the three factors; but it most certainly has two ends.

In the illustration let us suppose that the reamer has "snagged," the lathe is stopped, and the full power of the belt is being delivered to the holding device, tending to throw the shank off the center. The tail of the dog is bearing down upon the stick at *A* which, as Mr. Kelly says, would tend to lift the reamer shank off the center. But the downward pressure must be supported somewhere, and it *is* so supported at points *B* and *C*.

Because of the fact that the distance from *A* to *C* is, let us say, ten times the distance from *A* to *B*, nine tenths of the downward pressure delivered by *A* reappears as a downward pressure delivered by the stick upon the reamer shank at *B*. The tendency of the shank to rise by reason of the pressure delivered at *A* is, therefore, so nearly balanced by the downward pressure of the stick at *B* that the resultant is negligible. The further away the point *C* the more nearly is the balance established.

As regards "easing" the carriage along by hand—don't do it. Make sure that the tool shank (or whatever you put in the toolpost) bears against the yoke of the dog in such a way that the reamer cannot move toward the chuck without also moving the carriage, but be equally sure that it is so placed that it cannot interfere to prevent the reamer, dog and all, *from rotating with the lathe in case the stick should break*. You can then forget that the carriage is there; the pressure of the tail spindle will do all the "easing" that is necessary while the carriage will stay on the job ready to prevent any forward movement induced by the tendency of the reamer to "draw in," or when the drill breaks through the work.

There are two objections to the method, suggested by Mr. Kelly, of using taper shank tools. In a manufacturing operation upon specially fitted machines this would unquestionably be done; but in the toolroom and

the job shop it is often necessary to use tools that have no taper shanks, and even if such tools are available the feather and spline in the tailspindle of the average engine lathe is not calculated to shoulder the responsibility of resisting the torsional strain of the cut.

A Device for Riveting Small Parts

By Casper J. Dorer

It is often necessary when riveting small sheet-metal parts together on a large production basis, to have the two parts held together in an accurate relative position and to have the rivets driven accurately. Too often this fact is lost sight of, with the result that the rivets are driven in crooked, are never tight, and eventually shake loose. The rivets can also be made to serve as dowels, if properly set. The accompanying illustrations show a type of riveting fixture which is being successfully used for this kind of work in our production department.

The rivet used in this particular case is $\frac{3}{64}$ in. long and 0.070 in. in diameter. Owing to the smallness of the rivet, it is necessary to set it in place with a small pair of tweezers. The two pieces of stock are 0.015 and 0.097 in. thick respectively, and are attached to a shaft 10 in. long, which extends downward through the center of the fixture and through a clearance hole in the bench.

The fixture is easily and very quickly operated by an inexperienced operator, is foolproof and requires no hunting or balancing of the rivet head with the punch. It is generally this part of the operation that consumes the most time.

Upon examination of Fig. 1 it will be seen that the punches *A* are held in a vertical plane in the bracket *B*, the bearing being fairly loose. These punches are always held in their operative position away from the work by springs, and kept from coming out by screws *C*. When struck with a hammer these punches always

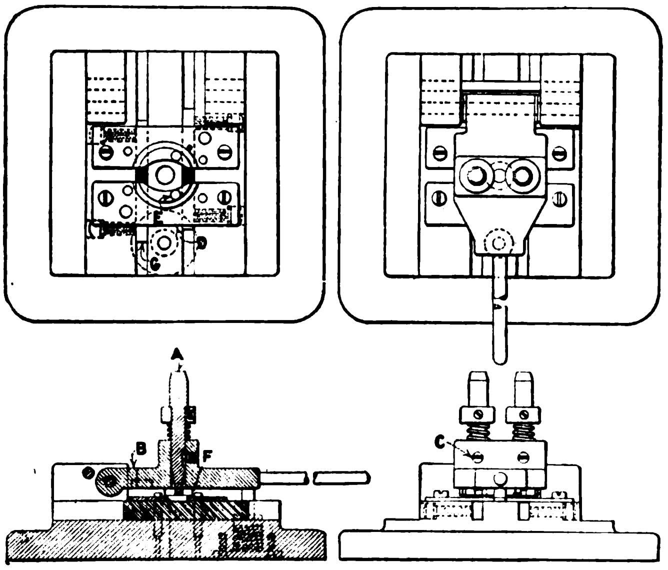


FIG. 1. DETAIL OF RIVETING FIXTURE

impart a perpendicular blow on the head of the rivet even if the operator should strike the top of the punch a deflecting blow. In order to prevent the rivet from sliding out from under the punch in case the rivet is not set square, the end of the punch is contoured slightly to suit the head of the rivet, thus causing the rivet to line up when the punch strikes it. Care must be used in forming the ends of the punches so that the concave part is not too deep as it is apt to cause the punch to split. The punches must also be placed in correct alignment with the rivet holes so that the force of the blow goes directly through the holes and is not deflected to one side.

The two pieces of work are placed in a nest *D* and over locating pins *E*, which keep them in their correct relative position while riveting. The bracket *B* is then swung down over the work until the button *F* rests upon

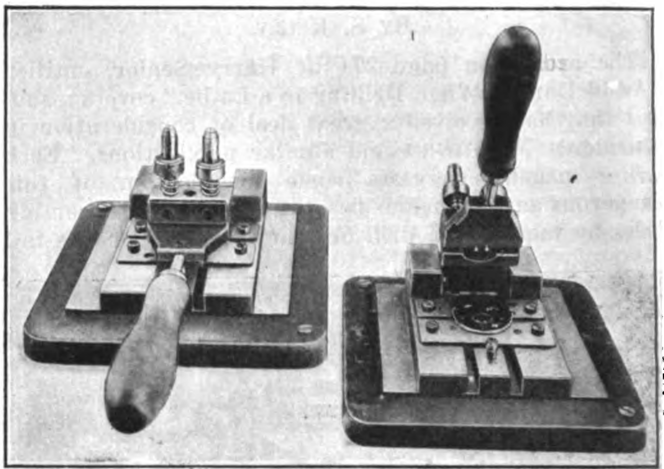


FIG. 2. THE FIXTURE IN OPEN AND CLOSED POSITION

it, the operator continuing to press down upon the handle so as to hold the work tightly together while he strikes the punches a blow with a hammer held in the other hand. It is essential that button *F* be of correct length so that punches will be in a vertical plane when the bracket is resting on the work. Thus the bracket serves a double purpose, acting as a guide for the punches and a clamp for the work.

A head such as is commonly formed on the opposite side is not made in this case. Instead the rivet strikes against the serrated hardened tool-steel strip *G*. The strips are set in the base of the fixture and are shiftable endwise, thus making it easy to renew the riveting surface. They are held in place by setscrews set in from the side.

The half tone, Fig. 2, shows the fixture both in open and closed position.

Enlarging Gas Engine Pistons

By Ivan C. Beach

In reference to a letter by David Tyke, on page 287 of American Machinist, the writer had a similar experience when he was called upon to refit pistons that were only a few thousandths under size.

I heated the pistons to a good red heat, stood them on a smooth plate (an old faceplate) on the floor with the solid end up and placed a weight of about twenty pounds upon each. When they had cooled I found that they had expanded about 0.012 in. and I had no difficulty in fitting them.

[The "swelling" of cast iron by repeated heating and cooling is often done. We doubt if the weight helped any. Have any of our readers data upon the amount of enlargement that can be thus obtained, or the wearing qualities of iron so treated?—Editor.]

A Shop Man's Method of Figuring Change Gears—Discussion

By H. Herring
Stockport, England

I have read with interest the article by J. Crommel, on page 78 of American Machinist, entitled "A Shop Man's Method of Figuring Change Gears," for the reason that I have myself been in the habit of using this method for many years. I think, however, that Mr. Crommel might have carried the matter a little further and shown how to arrive at the correct position for engaging the split- or half-nut with the leadscrew.

Let us take Problem I: Required, 60 threads in 4 in.; leadscrew 5 per inch. The lead of the thread is 4/60 and the ratio of change wheels 4/60 x 5/1, or $4/60 \div 1/5 = 20/60$, or 4/12. If we reduce this ratio to its lowest terms we get ⅓. This indicates that the leadscrew makes one revolution to every three of the spindle. In this case we can engage the nut with the leadscrew at any point of the lathe bed and the tool will come into pitch again for each successive cut.

Problem II: Required 27 threads in 5 in.; same leadscrew. The fraction expressing the lead is 5/27. Ratio of change wheels is 25/27; which is the lowest term. The nut can be engaged at every twenty-fifth revolution from the starting position, or, if the spindle and lathe bed have been marked, the nut can be engaged at every fifth inch, or multiples thereof, along the lathe bed.

Problem III: Required 10 threads in 7 in.; leadscrew 2 per inch. Fraction representing the pitch is 7/10. Ratio of change wheels is 14/10, which, reduced to its lowest terms, is 7/5. The half-nut can be engaged at every seven revolutions of the leadscrew or at every 3½ in. or multiples thereof along the bed.

Problem IV: Required 7 threads in 10 in.; same lead. The fraction is now 10/7 and the gear ratio 20/7. The half-nut will engage at every twentieth revolution of the screw or every 10 in. of its length.

Problem V: Required 4 threads in 4¼ in.; lead of screw 2 per inch. The fraction is 4¼/4, and the gear ratio 17/8. The nut will engage at every seventeenth revolution of the screw or every 8½ in. of its length.

I have found this method very useful when working on lathes that were not equipped with a carriage reversing movement.

Putting Limits on All Dimensions

By John Thomas

In the majority of drafting rooms, when dimensioning shop drawings, it is the usual practice to add tolerances only to those dimensions which require comparatively close limits and to give other dimensions merely a flat size such as 2¼ in., 0.750 in., etc. As a matter of fact, such unlimited dimensions mean nothing more than that the work should be made to that size only approximately.

This practice seems to me to be a mistake. Before a piece of work can be made from such a drawing, someone must either decide or find out the leeway allowable on sizes lacking limits. This usually means much time wasted in looking up "how they made them last time," or in discovering someone who will take the responsibility for such a decision. Very often this does not settle the matter, for it all depends on whether the decision is based on a guess or on definite information.

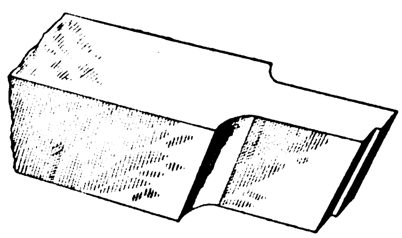
If we insist that our draftsmen limit all dimensions we will eliminate a lot of trouble and lost time in the shop. Often the operator wastes time in making a piece of work much closer to size than is really necessary, while the opposite may also be true. If $\frac{1}{16}$ in. more or less can be allowed on the work, the operator should know it definitely instead of being permitted to use his own judgment which probably would not coincide with the ideas of the designer of the piece.

Definite limits will help the operator in every way. He will get started on the job in less time, and will save time wherever possible. Definite limits will give him more confidence and help him produce better work, simply because he will know definitely what is wanted.

Easing the Pressure of the Cutting-Off Tool

By S. J. Morgan

On page 185 of American Machinist, there is an article under the above title, written by Clarence B. Coe, in which he advocates the making of a groove in the upper surface of a cutting-off tool for the purpose of easing the chips so that they will not pack in the cut.



CUTTING-OFF TOOL WITH DOUBLE LIP

The sketch herewith shows the way in which we accomplish the same result. Merely grind back approximately one-half the cutting edge for a distance of a few thousandths, making in effect two cutting lips instead of one. Then when the tool is put to work it will cut off two narrow ribbons of material and there can be no trouble from the jamming or packing of the chips in the cut.

Broaching With a Bearing Ball —Discussion

By James Griffin

On page 419 of American Machinist, Amos Ferber questions the advantage of the ball method of sizing holes, particularly in drawing dies, if the holes are to be lapped after hardening.

If a microscopic study were made of the metal surrounding the holes made by the ball and the reamer methods respectively, the crystalline structure of the metal in the case where the ball was used would be found to be more compact and closer grained than when the hole is reamed. This gives better wearing qualities and, I think, is an advantage.

Cutting Bolt Holes in Shims

By F. W. Cheatham

When you have a number of bolt holes to cut in thin sheet metal or fiber shims, select an ordinary cup-pointed setscrew with the cup of a size that corresponds to the desired hole, place it with the cup end upward in a vise, lay the shim over it and strike with a smooth flat-faced hammer. After the usual experience in cutting holes in shims you will be greatly relieved to find how easy it is to do a good job.

EDITORIALS

A Guiding Hand for Trade Associations

THE dilemma in which trade associations find themselves as the result of the Hardwood decision continues to be the subject of much discussion. The most recent developments include the Hoover Conference at Washington and the introduction, in Congress, of a tentative bill by Senator Edge placing such associations under the Federal Trade Commission; and of a Joint Resolution, fathered by Senator Edge and Representative McArthur, providing for a congressional investigating committee.

"Business is entitled to know in definite terms what it may and may not do," declares the preamble of the proposed joint resolution. This declaration will strike a sympathetic chord in many a weary heart. For fifty years American business has been struggling to attain certainty in its legal status. Ever since the first halting steps in great combination movements legal uncertainty has been an ever-present condition. Under the old common-law doctrines, under the state anti-trust laws and under the federal Sherman Act, business has been operating under the handicap of indefinite and negative restrictions. The process has been one in which business, denied definite positive guidance, has tentatively adopted in its tendency toward combination one legal form after another—the pool, the trust, the holding company, the merger—only to be checked and turned back by the Supreme Court, which has finally evolved that marvel of indefiniteness—the "rule of reason."

The latest decisions have made it clear that combinations in restraint of trade cannot be erected under the guise of open-price associations. One more experiment tried and the check once more applied! Business now asks for a statement of what it can do. It demands an opportunity to submit plans for trade-association activities to the federal trade commission for approval or disapproval before operations are begun.

The uncertainty which has been present has been costly in the past; much more costly than is ordinarily realized. If one were to attempt to devise a plan for dampening business enterprise, it would be difficult to evolve a more efficient implement than a threat of illegality. This type of uncertainty is a perfect wet blanket.

We do not mean to infer that business should be left free to do anything it chooses. So long as competition is the force relied upon to protect consumers from high prices, it will be necessary to prevent by law combinations in restraint in trade. We merely point out that certainty as to what is legal and what is illegal would greatly simplify the problem of the business man. How can one proceed confidently so long as the rules of the game are undetermined and constantly shifting?

In this particular case, moreover, uncertainty is likely to be particularly costly. Unless positive guidance is given, the trade association movement will receive a blow which will prevent, in large measure, the performance of many functions which are highly useful in the economic process and quite free from objection on the grounds of restraint of trade. For the fact-finding function of the trade association is really a risk-elimination function. If a business man can make his plans and decisions on the basis of fact and knowledge rather than guess and speculation, he can price more closely, eliminating the reserves and insurance premiums which inevitably accompany the conduct of business when surrounded by uncertainties. Trade associations now supply much valuable data and can be so developed as to supply much more. Such data are essential to wise business decisions and will result in fewer losses to business men and lower prices to consumers.

The Edge bill may not be perfect. Senator Edge does not pretend that it is. But certainly his proposals are steps in the right direction. It is possible to define fairly precisely the things which trade associations "may and may not do," and Congress owes it to the business community and to the country to make this clear.

Selling the War Surplus

IF WE needed a sidelight as to the cost of war, the sale of surplus materials would afford a good example. Over a billion dollars worth has already been sold and about as much more still remains to be disposed of. Major Glen E. Edgerton, director of sales, is planning an intensive campaign to get the rest of it out of the way. He realizes that, in some cases, it will work a temporary hardship on industry. But it must be sold and he believes that it is better to have the operation over with than to drag along with mere palliatives.

Roughly speaking, one-half the property declared surplus, something over two and a quarter billion dollars, was transferred to other governmental departments. The actual surplus on hand and ready for sale on March 1, represented an original cost to the taxpayers of $190,000,000. Although the most saleable property has already been disposed of, there is much valuable material in what remains. The material still available includes electrical equipment, hand tools, engineering supplies, machine tools, scrap metal, railway material, office supplies and the like.

It is interesting to note that during the first two years the average recovery from sales was 73 per cent of the original cost. The present average recovery rate is 25 per cent. The average for the whole, however, is 48 per cent which, all things considered, is a very high rate.

The lower rate prevailing at this time gives an idea of the relative saleability of the remaining surplus, as well as the lower prices prevailing in the open markets this year.

When the sale is completed the country will be in a more healthy condition, the treasury will be richer, the decks will be cleared for new business and we shall be decidedly nearer normal business in every way. Let all who can, hasten rather than delay the completion of the work which must be done. And let us appreciate the work done by all who have assisted in its doing.

Shop Equipment News

Blanchard High-Power Vertical Surface Grinding Machine

The Blanchard Machine Co., Cambridge, Mass., ha: added to its line of surface-grinding machines what it believes to be the heaviest and most powerful vertical spindle surface-grinding machine ever built. Fig. 1 shows the front view of the machine, which is known as the No. 27-R Blanchard high-power vertical surface-grinding machine. Overall dimensions of the machine are 12 ft. 6 in. long, 7 ft. 6 in. wide and 10 ft. high. The total weight is 30,000 lb. Floor space required is 12 ft. 6 in. x 7 ft.

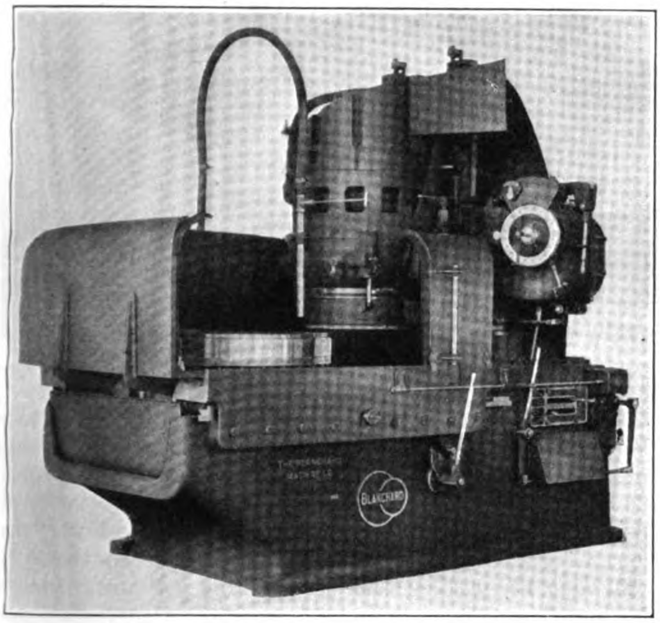
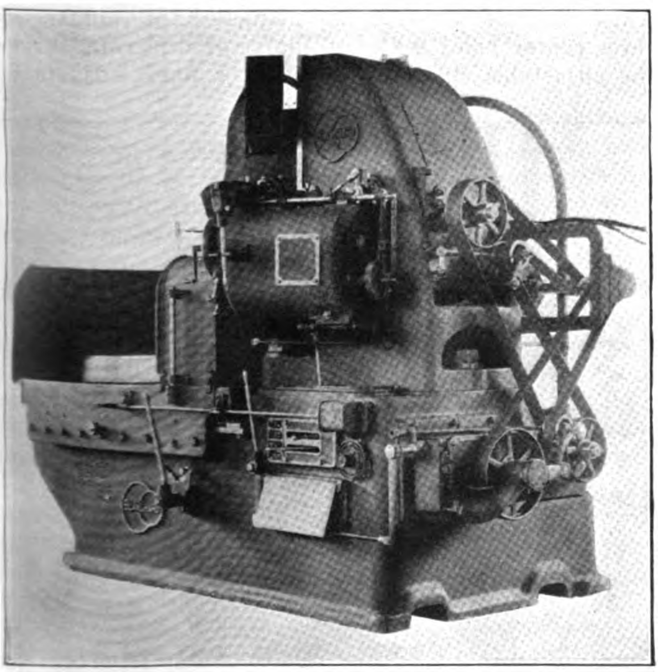


FIG. 1. BLANCHARD HIGH-POWER GRINDING MACHINE

In general arrangement it is similar to the No. 16 Blanchard grinding machine, and it operates in the same way. The work is carried on a rotary magnetic chuck, 48 in. in diameter, which is moved horizontally from the loading to the grinding position, and there rotated continuously while the wheel is gradually fed downward. Owing to its size and weight, the No. 27 chuck and table is traversed by power. In other respects the operation of the No. 27 is like that of the No. 16, although the mechanism is different.

The grinding wheel is 27 in. in diameter, 7 in. deep, with a rim either 2 or 3 in. thick. It is sulphur mounted in a cast-iron retaining ring, attached to the faceplate by six screws, and is wire banded in the same way as the No. 16 Blanchard wheels. The wheelhead weighs 3 tons and has built into it a 60-hp. 600-r.p.m. induction motor which drives the wheel at 580 r.p.m. or 4,170 ft. per minute. The rotor is directly on the wheel spindle, which is $5\frac{1}{2}$ in. in diameter and is carried on two large radio-thrust ball bearings. A spring take-up at the upper end exerts an upward pull on the spindle which exceeds the weight of the rotating parts by 1,000 lb. This initial load on the lower or main thrust bearing eliminates all play or backlash. The main bearing has a thrust capacity of over 25,000 lb.

The wheel safety guard is of $\frac{5}{16}$-in. steel plate, carried on three heavy steel rods, and has a convenient rack and pinion mechanism for vertical adjustment. A wheel dresser attached to the head provides for dressing or sharpening the face of the wheel while grinding. There is the usual water supply to the inside of the wheel through a 2-in. pipe, and to the outside nozzle



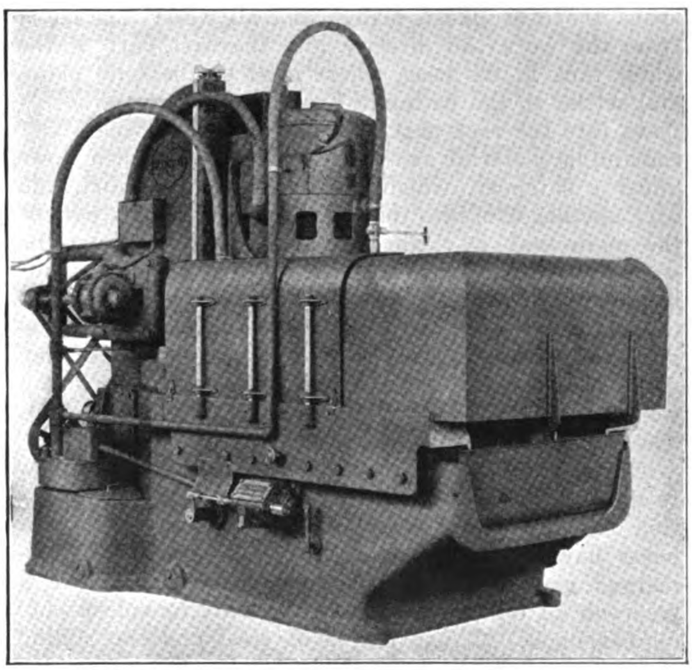


FIG. 2. RIGHT-END FRONT VIEW OF BLANCHARD GRINDING MACHINE. FIG. 3. REAR VIEW

through a 1½-in. pipe. Waterguards of ⅛-in. steel plate, entirely surround the work and wheel.

The head is mounted to slide vertically on a massive column, whose proportions are best seen in Fig. 2. The Blanchard three-point support is used to fasten the column to the base.

The vertical motion of the wheelhead is controlled by a heavy feed screw, 4½ in. in diameter, carried in ball bearings in the column. This screw is driven through a gear box mounted in the column, receiving its power from the upper pulley in Fig. 2. Double friction clutches provide for rapid raising or lowering of the wheelhead. Both hand and power feeds are provided by means of the box on the front of the column. The power feed has an automatic stop, also a convenient adjustment, giving feeds from 0.0005 to 0.005 in. per revolution of the chuck. A single lever controls the engagement of the power feed and of the raising and lowering clutches, and is arranged so that they cannot be simultaneously engaged.

Referring further to Fig. 2, in the lower portion will be seen a large pulley which drives the chuck rotation, and to the left of it, the pulley which drives the water pump and table traverse. The chuck is driven through a four-speed sliding-gear box, with friction clutch for starting and stopping, interlocked with the gear shift. The speeds are 3, 5, 8 and 13 r.p.m. Power for all purposes, except driving the wheel, is supplied by a 5-hp. motor on the farther side of the column, to be seen in Fig. 3. This view also shows the pump and water piping and the box containing the clutches for the traverse motion of the chuck.

The rotary magnetic chuck for holding the work is 48 in. in diameter and is of the Blanchard one-piece steel type. It has closely spaced poles suitable for holding either small or large work. The face is of brass and steel, and is said to be absolutely waterproof so as to prevent damage to the windings.

The chuck is carried on a substantial table, sliding on the base on one flat and one V-way. This table spans the base like a bridge and all water and metal from the work fall directly into the first part of the water tank in the base, where most of the solid material settles to the bottom. From here the water overflows into the rear part, under the column, where any remaining material can settle. The water then flows under a skimmer, which holds back floating dirt, and over another dam into the pump tank. The first part of the main tank is cleaned from the left end, and the second part has a large cleanout opening near the right-hand end on the front. Both parts are so arranged that the entire bottom can be reached with the hoe provided, and an inclined end leading to an overhanging drip edge makes it easy to remove the mud. The pump tank is accessible for cleaning, but rarely requires it. The total water capacity is 42 gallons.

The machine is constructed throughout with a view to durability and low maintenance cost. The lubrication has been carefully studied, and both main gear boxes have pressure feed to every bearing from submerged gear pumps. Other important units have a reservoir of oil with means to circulate or splash onto all bearings. All gearing is of steel and the sliding gears are of heat-treated alloy steel. The protection against dirt and water is complete.

Brown & Sharpe No. 4 Universal and Crankshaft Grinding Machine

For use in motor service shops for grinding automotive parts, the Brown & Sharpe Manufacturing Co., Providence, R. I., has recently added to its line of grinding machines the No. 4 universal and crankshaft grinding machine illustrated in Fig. 1.

The machine is adapted to a large variety of work. It grinds crankshafts, pistons, wristpins, valve seats and stems, in addition to the regular straight and taper grinding of which a universal machine is capable. With an internal grinding attachment and chuck, it does internal and face grinding on such parts as individual cylinders, clutches, and transmission gears. All ordinary parts of motors can be ground in the machine, excepting cylinders *en bloc*. By using a toothrest, it will also grind line reamers, milling cutters, centers, boring bars, and other tools.

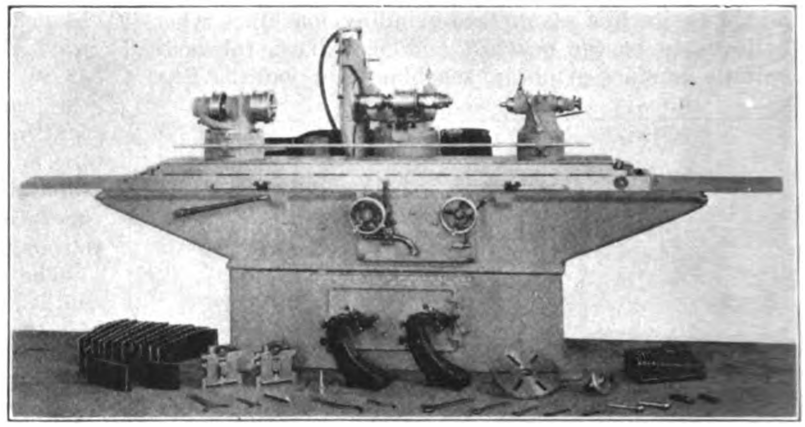


FIG. 1. BROWN & SHARPE NO. 4 AUTOMOTIVE GRINDING MACHINE

The throw-blocks are made with tool room accuracy, and their sides are finished to an exact size in relation to the center holes in the sliding blocks. This permits the crankshaft to be readily aligned by placing the blocks on their sides upon a surface plate. Other features of the blocks are the adjustable clamp caps which provide for various diameters of shafts, the three center holes for crankshafts of different throws, the adjustable slide for obtaining a finer adjustment,

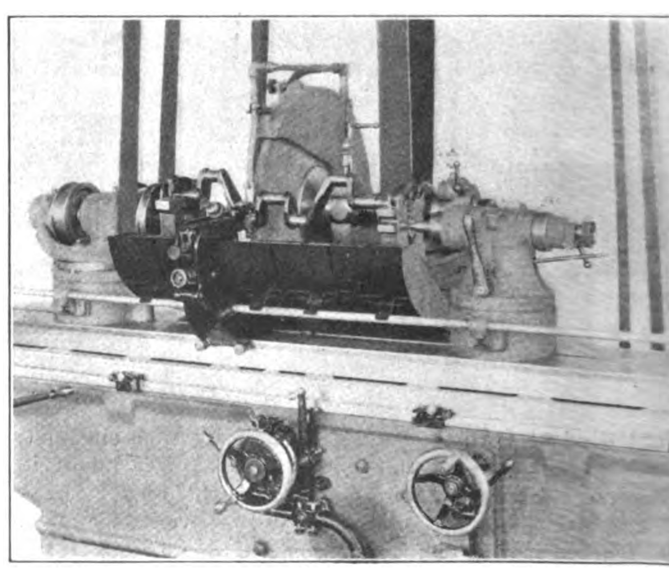


FIG. 2. GRINDING CRANKSHAFT ON B. & S. NO. 4 MACHINE

and the special extension of the slide block used on the headstock end of the crankshaft. This extension, with its recess, provides for grinding flanged crankshafts. A crankshaft in place is shown in Fig. 2.

The piston arbor permits of saving time in mounting pistons. The piston is mounted on dead centers and is also ground upon its own centers, which trues up a seasoned piston concentric with the axis upon which it was first turned. For valve grinding, the wheelslide is set at the desired angle and the corner of the wheel is moved across the valve seat. The table remains stationary and the crossfeed traverses the wheel across the face of the valve seat.

Aside from a few special features necessary to accomplish its particular purpose, the machine is similar in construction to the regular No. 4 Brown & Sharpe universal grinding machine. By removing the raising blocks from under the headstock and footstock, changing the size of the grinding wheel and its guard, and making slight additions to the equipment, the machine can be converted into the No. 4 universal grinding machine. The machine swings $22\frac{3}{4}$ in. in diameter, $15\frac{1}{2}$ in. over the water guards, and takes 60 in. in length.

The tool steel wheel spindle has hardened bearings, ground and lapped, and running in self-aligning, phosphor-bronze boxes provided with means of compensation for wear. The spindle and boxes can be easily removed

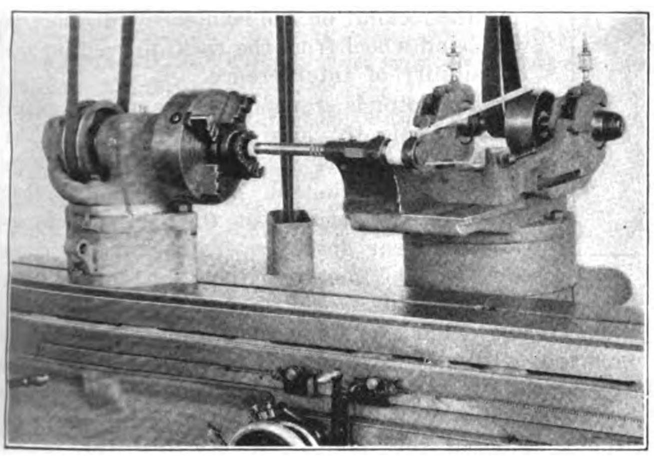


FIG. 3. INTERNAL GRINDING FIXTURES FOR B. & S. NO. 4 MACHINE

to make room for the internal grinding attachment. The automatic crossfeed will move the wheel from 0.00025 to 0.004 in. at each reversal of the table, as desired. It is automatically disengaged when the work is ground to size. The table travel is automatic and is controlled by easily adjustable dogs.

The speeds and feeds of the wheel and work and table are entirely independent of each other. A single lever starts and stops the rotation of the work and the feed of the table. The table reversing mechanism is very accurate, allowing work to be ground close to a shoulder.

The base of the machine rests on the floor at three points. This construction maintains the alignment of the table, and prevents it from being affected by any inaccuracies of the flooring. The box-like construction of the frame with the ample overhang at each end gives firm support for the table, especially at the end of its traverse. Strong ribbing extending the entire length of the table keeps it rigid and prevents it from sagging.

The grinding wheel is 24 in. in diameter, 1 in. thick, and has a 5-in. hole. It is protected by a heavy guard, which helps to confine the spray and particles of abrasive. The footstock carries the holder for the carbon point, and the wheel can be trued without removing the work from the centers.

Included in the equipment are two universal adjustable backrests for supporting slender work or splined shafts. They automatically compensate for the decrease in diameter as the work approaches size. Their use is illustrated in Fig. 2. For wet grinding there is a supply of water furnished by a pump from a tank attached to the rear of the machine. This pump is of simple construction, delivers the water in a steady stream, and requires no packing or priming. The telescopic water guards protect the operator from spray.

The equipment shown in Fig. 1 is included with the machine. Fig. 3 shows the machine set up for internal grinding. The floor space required at right-angles to the spindle is 52 in., and parallel to the spindle 207 in. The hollow base is fitted as a closet to hold small tools and accessories.

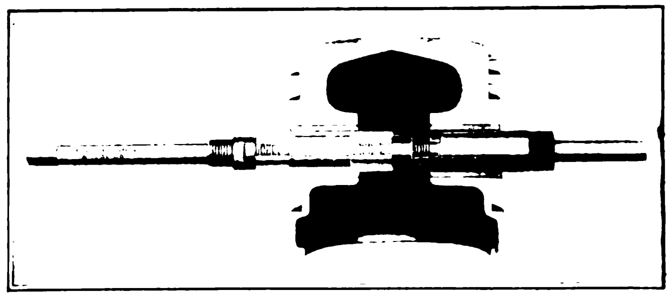
Alvord Piston-Pin Bushing Reamer

The illustration shows the "X-Cel" adjustable piston-pin bushing reamer with pilot, recently introduced by the Alvord Reamer and Tool Co., Millersburg, Pa. The cutter of this tool is very similar to the regular Alvord adjustable reamer and is adjusted in the same manner, but the shank and pilot stem are ground to an accurate sliding fit with the taper plug shown, and are parallel and concentric with the cutting edges.

By passing the pilot stem through the piston-pin bushings and then slipping the taper plug on the pilot and pressing it into the bushing, the reamer is centralized and supported and reams the bushings in correct alignment and with no chatter. With pistons of small diameter and correspondingly short pin lengths it is sometimes necessary to ream first one bushing, and then reverse the reamer and plug and ream the other bushing. In this case, the second reaming operation is centralized from the bushing already reamed.

This tool is simple to operate as there is no adjustment necessary on the taper plug, which fact materially decreases the time necessary to fit a set of pins. The taper of the plug is sufficient to cover the range of adjustment of the reamer, but is gradual enough to align the reamer in place.

The reamers are made in eight different sizes, and cover a range from $\frac{5}{8}$ to $1\frac{11}{32}$ in. A special set designated as Set No. 503, has been assembled which consists of four reamers and which will ream standard and oversize holes for practically all of the leading cars on the market.



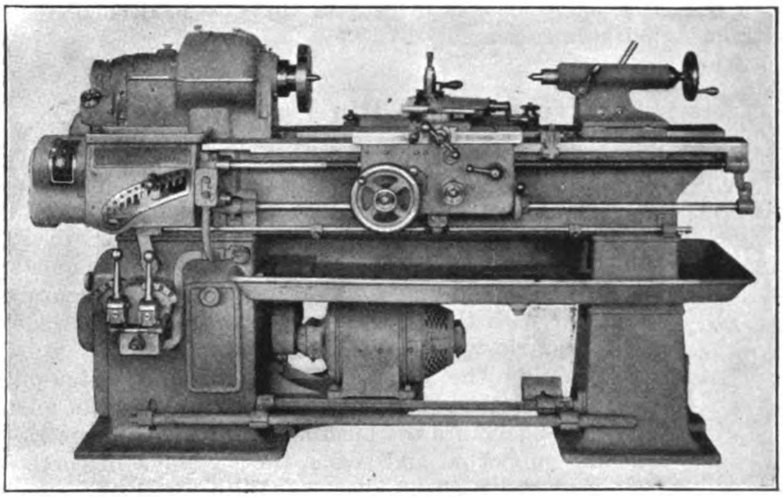
ALVORD PISTON-PIN BUSHING REAMER

Hendey 14-In. Toolroom Lathe

The Hendey Machine Co., Torrington, Conn., has placed on the market recently a motor-driven toolroom lathe that embodies some noteworthy features.

A departure from customary practice is the mounting of the motor on a shelf beneath the oil pan, where it cannot obstruct light or interfere with the vision of the operator. The motor drives the speed-box through an Oldham coupling having no screws or bolts, and may therefore be removed or replaced without preliminaries other than withdrawing the holding-down bolts and disconnecting the wires. The motor pinion, being supported by independent bearings, remains in place in mesh with the second gear.

Within the pedestal an oil-tight change-gear box is so mounted as to swing about the center of the second shaft, and from a pulley on the exterior of this box a belt goes directly to the single driving pulley on the spindle. The weight of the gear box maintains a constant tension on the belt, thus eliminating trouble from stretching of the belt and danger of breakage from possible snagging of the tool in the cut.



HENDEY 14-IN. TOOLROOM LATHE

Nine changes of speed are available by means of the gear box, and are controlled by the position of the two levers on the front of the pedestal. A positive interlock prevents interference of the gears. An easily removable cover on the front of the pedestal gives access to the gear box, while by removing the end plate and disconnecting the control levers, the entire gear box and attached mechanism may be removed without interference with other parts.

The single driving pulley is mounted on a quill extending nearly the full length of the spindle, and ample provision is made for lubrication. The entire top half of the head cover is in the form of light plates that may be lifted off by merely turning the knobs, thus rendering the spindle easily accessible for readjustment. The cone lock is reached by lifting the small swinging cover over the large gear.

The usual form of back gearing, mounted on a quill running on a stationary eccentric shaft, is provided. The operation of putting in or taking out the back gears is performed in the same manner as in the older form of Hendey lathe. The ratio of the back gearing is such that nine additional speeds are available, making eighteen in all.

A complete range of threads and feeds is provided by the two gear boxes controlled by the two upper levers. The small lever on the circular dial at the left of the headstock slides the idler gear into or out of mesh, so that the spindle may be run at high speeds without running the gears.

The spindle conforms to the usual Hendey design, running on tapered bearings that are easily adjustable to compensate for wear. A different method of sustaining the end thrust is introduced, which distributes the load over ample wearing surfaces and makes adjustment easily and quickly possible.

Improvements in the design of the carriage and cross-slide add rigidity and convenience. The ratio between crossfeed and carriage traverse is carefully calculated and intended to give accurate tapers or bevels when the two are used together. In conjunction with the taper attachment, an extremely wide range of tapers is available. The tail spindle is graduated and the footstock provided with an improved form of locking device.

Every moving part except the spindle nose and the lead screw is completely covered, thus minimizing the possibility of accident. The lead screw is provided with the usual reversing lever in the apron, and with a positive knockout in either direction to be used when turning between shoulders. Closing the locknut on the lead screw disconnects the hand wheel from the rack, preventing the possibility of interference.

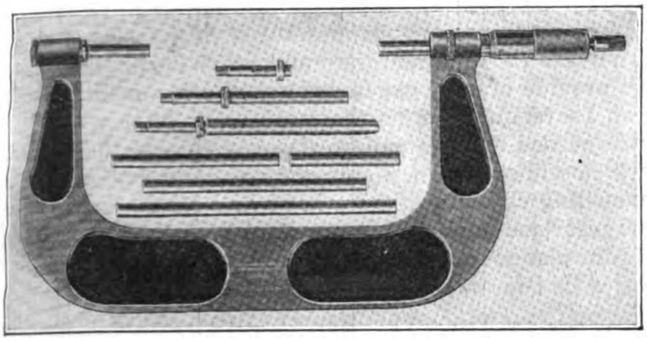
The motor is stopped and started by means of conveniently located pushbuttons. The speed change levers are interlocked with the electric control mechanism, so that the first movement in the act of changing the gear speeds operates to slow down or stop the motor without attention from the operator.

The treadle extending along the front of the base is connected with the swinging gear box so that the operator can, by the pressure of his foot, stop the lathe for the purpose of calipering or inspecting the work without stopping the motor. Depressing the treadle raises the gear box and releases the tension of the belt. The operator is thus enabled to stop the lathe from the extreme end without the necessity for reaching the control buttons. In its lower position the weight of the gear box rests partly on the belt and partly on an adjusting screw, so that the belt tension may be adjusted as the nature of the work may require.

Brown & Sharpe No. 55 Micrometer Calipe

The Brown & Sharpe Manufacturing Co., Providenc R. I., has recently increased the range of its No. 5 micrometer caliper. By means of the four detachab anvils, shown in the illustration, the tool can be adapte to measurements from 2 to 6 in., instead of from 3 t 6 in. as formerly. The anvils can be quickly change and held securely in place by a knurled nut. One anv is for measurements from 2 to 3 in., another from to 4 in., and so on.

The tool is especially useful in garages and servi stations where small pistons, many under 3 in. in dia eter, and also large pistons for trucks and tracto require accurate measurement. It can measure



BROWN & SHARPE NO. 55 MICROMETER CALIPER

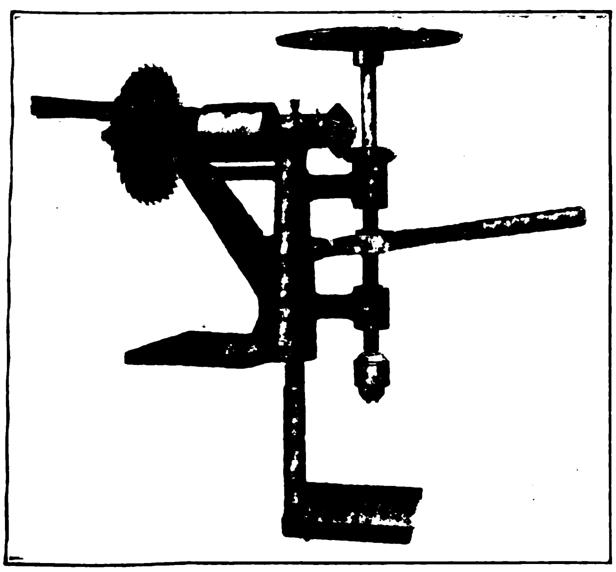
ordinary sizes of pistons and cover the same range of work as three or four ordinary micrometers. In general construction it is similar to other Brown & Sharpe micrometer calipers.

Reeves Combination Bench Machine

The Ster-O-Lock Manufacturing Co., 417 So. Dearborn St., Chicago, Ill., has recently developed the machine shown in the illustration, which is known as the Reeves machine. This machine is a combination tool intended for use in the garage or service station. It is adapted to mounting on a bench.

By employing the various attachments that are supplied, the machine can be used for drilling either wood or metal, for surfacing or sanding, disk grinding, polishing, buffing, rough or tool grinding, or for rip-sawing wood. The table through which the rip-saw protrudes can be removed in order to allow the various attachments to be adjusted, or the table can be tilted, for sawing at an angle. The horizontal disk at the upper end of the spindle is intended to be used for disk grinding or surfacing.

The frame of the machine is cast in one piece, and the spindles are of high-grade carbon steel. The horizontal spindle is connected with the vertical spindle through a positive steel clutch, which can be disengaged when using the horizontal spindle only. Both spindles run in bronze bearings. The vertical spindle has a range of $3\frac{1}{2}$ in. without adjustment, and is supplied with a Jacobs chuck that will take drills up to $\frac{5}{8}$ in. The drilling table is adjustable in position.

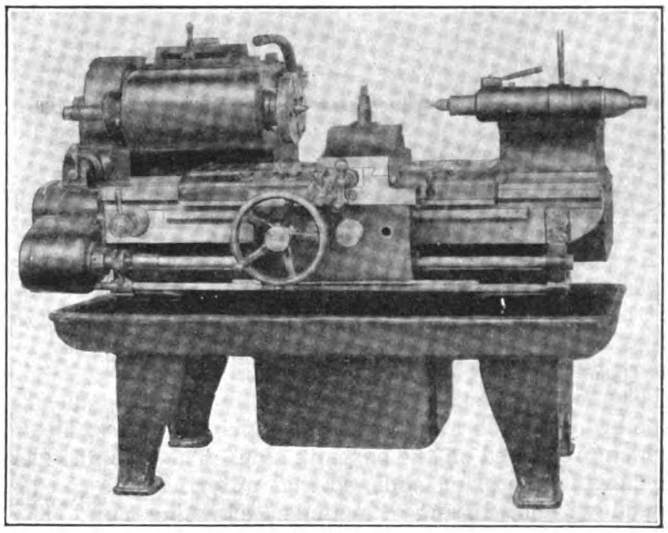


REEVES COMBINATION BENCH MACHINE

Sundstrand 12-In. Manufacturing Lathe

The Rockford Tool Co., Harrison and Eleventh Sts., Rockford, Ill., has recently placed on the market the 12-in. Sundstrand manufacturing lathe shown in the accompanying illustration. The machine is constructed on the same general principle as the 9-in. Sundstrand lathe described on page 1028, Vol. 48, of AMERICAN MACHINIST, with the exception of its greater swing and combining features necessary for a machine of larger range and capacity. In the design of this lathe special attention has been given to obtaining a compact and rigid machine, capable of standing up to the demands of specialized production, yet flexible enough to be used for a great variety of work. It is equipped with cross-feed, quick-change feed and reverse to the carriage, and is adaptable to thread cutting by substituting a lead screw in place of the feed rod.

The headstock gives nine speeds selective. The drive is of the single-pulley type, with a friction clutch in the large driving pulley. The same movement that disengages the clutch automatically applies a brake, which stops the spindle instantly. For attaching air cylinders, draw-in attachments and expansion chucking devices, an extension is provided at the outer end of the spindle.



SUNDSTRAND 12-IN. MANUFACTURING LATHE

Specifications—Swing: over carriage, 12 in.; over cross-slide, 10 in. Distance between centers, 18 in. Hole through spindle, $1\frac{1}{16}$ in. Diameter of drive pulley, 12 in. Width of drive belt, 4 in. Speed of drive pulley, 200 r.p.m. Number of feeds, 29. Number of spindle speeds, 9. Toolbit, $\frac{5}{8} \times 1\frac{3}{8}$ in. Floor space, 35 x 70 in. Weight: net, 3,130 lb.; domestic shipping, 3,330 lb.; export shipping, 3,500 lb.

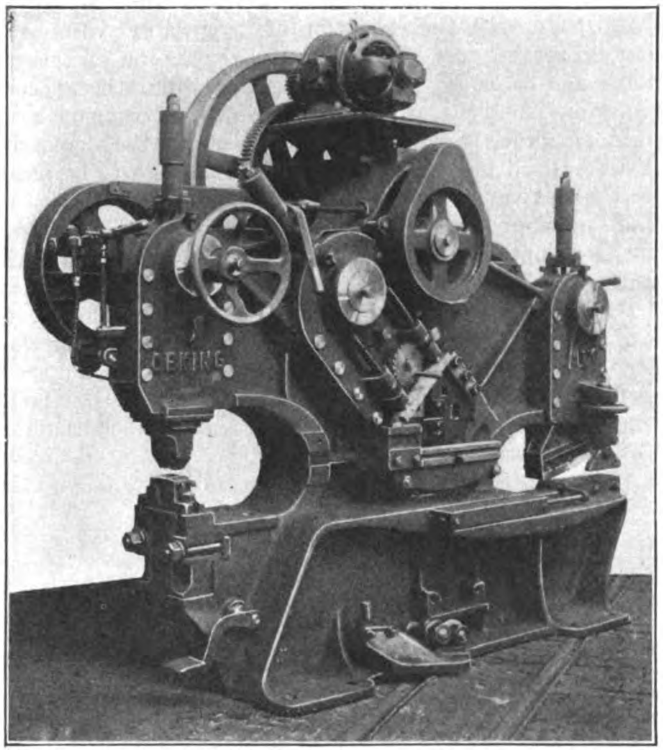
The main spindle taper bearings are made of bronze bearing metal, adjustable for wear.

A special feature on the carriage is the multiple-stop collar, which makes a positive stop for the cross-slide when turning shafts with shoulders and different diameters. The carriage, which has exceptionally long bearing surfaces on the ways and is arranged with a slide block for a taper attachment, has lugs on top that are drilled and tapped to permit the mounting of extra cross-slides or special toolholder blocks.

The apron is of the double-wall type, with a minimum number of working parts and gears. A simple feed reverse box, of bevel-gear and clutch type and having steel gears and bronze shaft bearings, is regularly furnished. A quick-acting tailstock is supplied as standard equipment. Taper attachment, draw-in attachment and rear toolblocks can be furnished.

Oeking Triple Combination Punching and Shearing Machine

The combination punching and shearing machine shown in the accompanying illustration has recently been placed on the market by Amplex, Inc., 6 West 32nd Street, New York, N. Y. The machine is economical in floor space, and can be adapted to different types of work without the necessity of changing tools.



OEKING PUNCHING AND SHEARING MACHINE

The operator's side of the machine is clear of encumbrances such as flywheels and driving gears, all of which are placed on the opposite side. The machine has a slanting centering slide, so that mitering cuts can be made without lifting the angle bar being cut. The plate shear has longer knives than employed in former models of the shearing machine. The lengths are for the No. 16 machine, 13 in., and for the No. 20 machine, 16 in., against former lengths of 9 and 11 in., respectively. There is ample room behind the knives to avoid binding the plates being cut.

The punch is arranged for punching both webs and flanges of structural shapes, and the height of the throat is designed for handling broad flanged Bethlehem shapes. The punch is provided with lowering devices to ascertain the center mark before punching, and both hand and foot levers are provided to throw the machine into gear. The springs as well as the gears are enclosed, so as to safeguard the operator. The bar and angle cutter cuts any structural shape, but the standard equipment provides for cutting rounds, squares, angles and tees only. The knives can easily be exchanged for cutting beams and channels.

The machine is constructed so as to provide durability. The frame is cast steel. The slides are also made of steel and are adjustable. The covers of the slides are attached to the body by pin bolts, so that they cannot work loose. The bearings have large surfaces; they are bronzed bushed and provided with ring lubrication.

The machines are manufactured in a series of sizes. They are fully standardized and provision has been made to provide cranes, gages and other attachments, which can be furnished with the machine or later when they are needed. The smallest size machine is the No. 13, which will split ½-in. plates and cut 3½-in angles, with a punching capacity of ⅞-in. holes in ½-in. material. The largest size machine is the No. 32, which will split 1¼-in. plates, cut 8 x 8 x ¾-in. angles and punch 1¾-in. holes in 1-in. material.

Marvin & Casler Reamer Holder

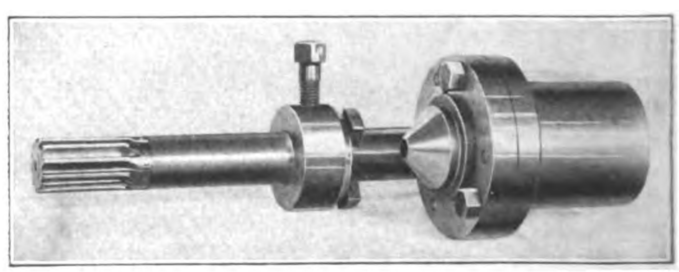
The Marvin & Casler Co., Canastota, N. Y., has recently placed on the market the equipment shown in the accompanying illustration for holding reamers on screw machines or lathes. The holder is not intended to float, but operates on a different principle. In order to ream a straight, true hole it is assumed necessary to hold the rear end of the reamer in line with both the center line of the machine spindle and of the hole to be reamed.

The bushing or adapter sleeve shown at the right of the illustration is suitably mounted on the turret of the lathe on which the holder is employed. The faceplate on the front of the bushing is held by three capscrews. With this equipment on the turret, the work is first bored, then faced a short distance from the hole and the corner chamfered so as to provide the proper bearing for a tapered plug.

The cone-shaped centering plug is placed in the faceplate of the holder and the turret is moved toward the work. As soon as this cone plug enters the bored hole, it brings the faceplate concentric with the spindle of the lathe. While the plug is held tightly against the work, the capscrews are tightened so as to secure the faceplate.

The turret is then backed away, the cone plug removed and the reamer holding sleeve inserted in its place. This sleeve maintains the reamer securely in position and insures that its rear end will be in line with the center line of the work and of the machine spindle. The reamer holder can be disengaged in order to fit it to other reamers. Ordinarily the entire reamer may be passed through the adapter sleeve, so that only that portion of the reamer necessary to make the cut is required to overhang. The reamer shank thus projects into the turret.

The faceplates, the holder sleeves and the center plugs are all interchangeable, and only one plug is ordinarily required for a group of machines. The reamer holding sleeves can be supplied in sizes to suit the reamers that are used. Special fittings and the adapters necessary for attaching the holder to different makes of machines can be provided.



MARVIN & CASLER CENTERING REAMER HOLDER

Lassiter-Millholland Staybolt Machines

The Dale Machinery Co., Inc., New York, N. Y., has recently placed on the market two horizontal staybolt machines. The machines are manufactured by the Millholland Machine Co., Indianapolis, Ind., and are known as the Style A and Style B, Lassiter-Millholland staybolt machines. The Style B machine, illustrated in Fig. 1, is used for turning simultaneously the taper and straight diameters on radial, button-head and crown staybolt forgings, and for threading both the straight and taper ends, also simultaneously, in uniform pitch and continuous lead.

For turning, the bolt is gripped in a collet with special collet bushings and adjustable stop. The turning feed is then engaged by means of a friction, which is driven by a spline in the feed shaft, and the two Modern turning heads are fed over the portion of bolt to be turned, thus machining both ends at the same time, the chasers in the dieheads having been replaced with cutters, so that the tool acts as a hollow mill. The front head has a taper attachment which can be adjusted to any desired taper. This attachment allows the front diehead to open gradually as the slide moves forward. The cutters in the rear diehead are straight, and those of the front head tapered. Both dieheads are automatically tripped at the end of the cut, and are automatically closed by adjustable cams mounted on a slotted bar on the rear of the machine.

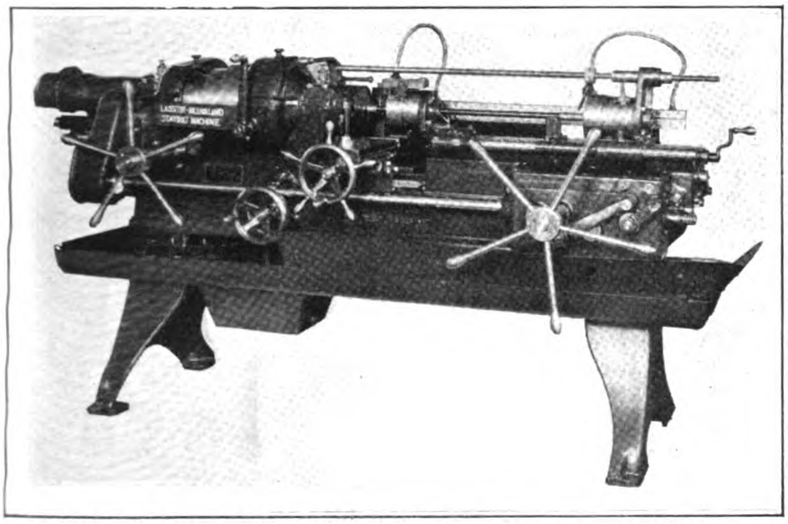


FIG. 1. MODEL B LASSITER-MILLHOLLAND STAYBOLT MACHINE

For threading, the cutters in both heads are replaced with chasers. The heads being closed, the threading feed is engaged by closing two half nuts on the lead screw, which feeds the dieheads at the desired pitch and does not allow creeping or lagging. As the dieheads are held in constant relation on the slide, a bolt of continuous lead and uniform pitch is the result.

To enable the machine to be adjusted to any desired length within its range, the rear diehead carrier is adjustable on the slide by means of a fine-pitch screw. A permanent spacer bar very accurately made is furnished with each machine. This bar has twenty-three holes accurately bored and spaced 1 in. apart, to correspond with the various lengths of bolts. The rear diehead carrier has a pin which when inserted through any of the holes in the bar sets the dieheads in continuous lead without further adjustment.

A cross slide with hand crossfeed and hand longitudinal adjustment is provided for facing and undercutting the button-head bolts. The machine has a capacity for bolts from $\frac{3}{4}$ to $1\frac{1}{2}$ in. in diameter and 14 to 36 in. long. It is supplied in cone-driven or geared-head design, the latter arranged for single-pulley or motor drive. Seven hundred bolts 28 in. long per day of nine hours have been completed by one operator.

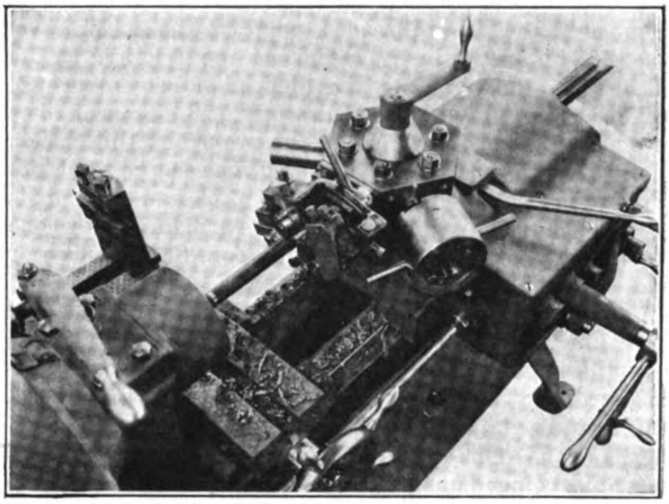


FIG. 2. BOX MILL IN POSITION ON MODEL A LASSITER-MILLHOLLAND STAYBOLT MACHINE

The Style A machine is used to make side stays from the bar of either iron or copper. This machine turns the relieved portion in the center of the bolt and threads both ends in uniform pitch and continuous lead. The machine is rigidly built and is provided with a special feed-box apron, and splined lead screw.

A hexagonal turret is mounted on a slide, which moves directly on the ways of the machine, no saddle being used. Taper gibs are provided where necessary to compensate for wear. A double-plate apron is attached to the slide.

The stock is fed through the spindle and automatic chuck bar by the bar feed, up to a

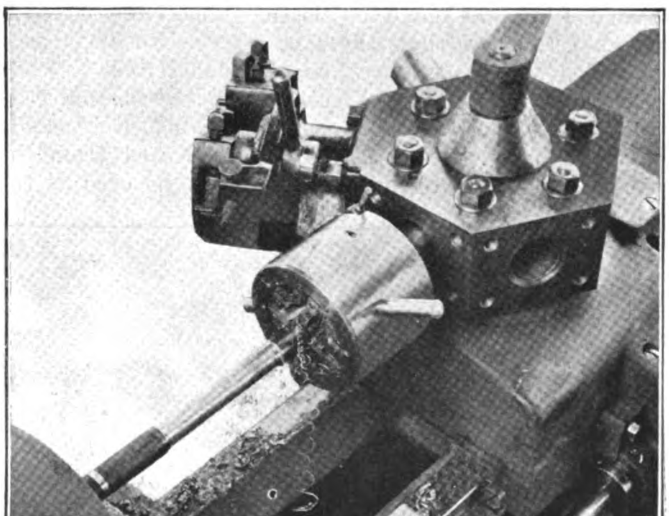


FIG. 3. DIEHEAD IN POSITION

stockstop mounted in the turret. The center portion is then relieved by a box mill of special design, as shown in Fig. 2. The box mill being withdrawn, the diehead indexes into position and is fed onto the work by engaging the half nuts with the lead screw. When the diehead completes the first threaded portion, the machine is speeded up instantly by means of the friction in the headstock, thus passing the diehead quickly over the relieved portion with the lead screw still engaged. The machine is then slowed up to the proper cutting speed, the threading operation completed and the bolt cut off. This produces a bolt with uniform pitch and continuous lead. The Style A machine also is furnished with cone drive or a geared head arranged for single-pulley or motor drive.

In both styles of machines both the turning and threading feeds are automatically tripped. The friction clutch which is used for turning is automatically disengaged, and the half nuts which are used during threading also are tripped at the same instant that the dieheads open. This guards against any possibility of the machine being damaged, should the operator not be in attendance when the threading operation is completed.

A safety device is supplied which allows only one feed to be engaged at a time, and it is impossible to engage both the friction and half nuts at the same time. Modern dieheads are used on both machines.

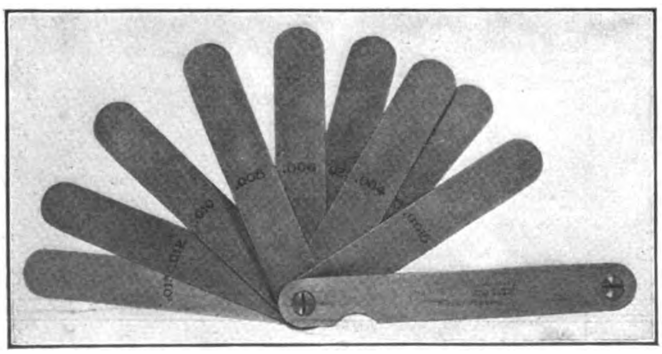
Lufkin Thickness Gage With Lock

A thickness or feeler gage recently placed on the market by the Lufkin Rule Co., Saginaw, Mich., is provided with a lock by which the blades may be held in any position. This lock consists merely of a knurled-head nut that clamps the leaves tightly together when it is turned a fraction of a revolution.

The gage is adapted particularly to the use of automobile mechanics and repair men. When making adjustments of tappets on motors, the proper leaf can be used at the full length of the tool of 5½ in. In this way, fits can be gaged in places difficult of access.

The gage is made in several styles. The No. 06 carries six leaves having thicknesses of 0.002, 0.003, 0.004, 0.008, 0.010 and 0.015 in. The No. 07 has in addition a 0.0015-in. leaf. The No. 09 has nine leaves 0.0015 to 0.015 in. in thickness. The 0.015 leaf and the nameplate form the case, so that the thinner leaves are well protected when the gage is closed. The No. 109 tool, which is illustrated, is the same as the No. 09, but is provided with a case in which the blades fold.

On all of the gages, the leaves are ½ in. wide and 3 in. long. The removal and insertion of blades is easily accomplished. If two leaves are separated from the others and locked in position, they may be used as the upper and lower limits that are permissible in the fit. The leaves are accurately ground to size, which is marked on each. When the gage is closed and locked, the blades are protected.



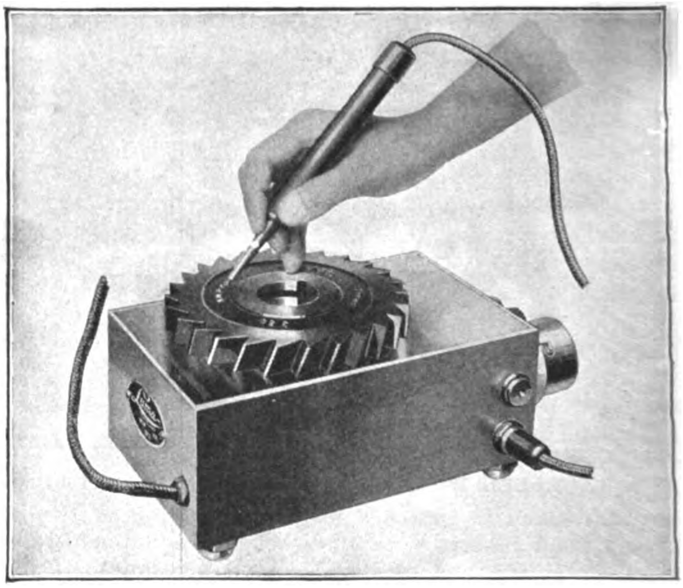
LUFKIN THICKNESS GAGE WITH LOCK

Luma Electric Etching Pencil Outfit

The Luma Electric Equipment Co., 405 Spitzer Bldg., Toledo, Ohio, has recently placed on the market the electric etching pencil outfit shown in use in the accompanying illustration. The device consists of two major units, a magnetic table, and the pencil itself. It is adaptable to several uses, the chief of which are etching or writing on hardened steel, demagnetizing steel, annealing and soldering.

By using the magnetic table of the device, work that has been placed on a magnetic chuck can be easily demagnetized. It is merely necessary to pass the piece across the table while the current is turned on, to accomplish this result. Similarly, tools or bars may be magnetized. A file or scribe may thus be employed for removing chips from holes, or for holding small screws and such work in place. It is merely necessary to lay the tool on the table, turn on the switch, then turn off the current and remove the part.

The etching pencil permits of marking sizes, numbers and such inscriptions on tools and hardened steel. The cord of the etching pencil is attached to the table, on which the tool to be marked is laid. When the current is turned on, it is possible to mark the work, with no more pressure than required for ordinary writing.



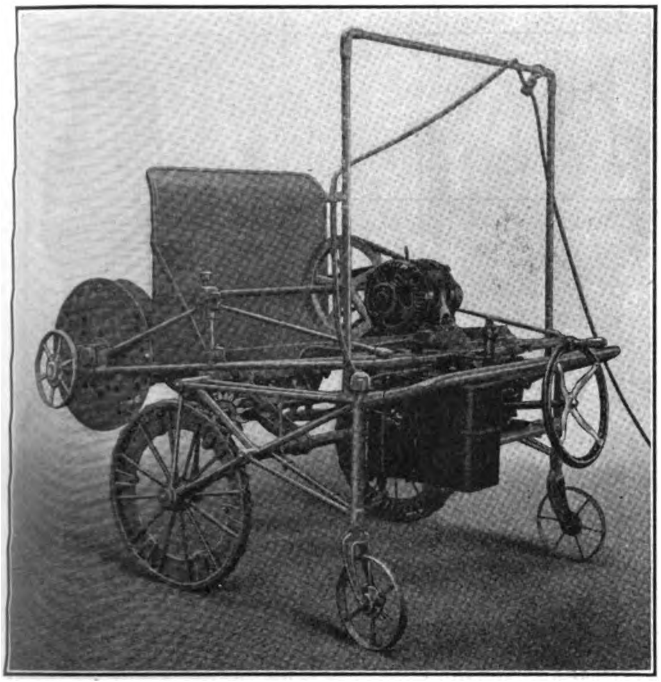
LUMA ELECTRIC ETCHING PENCIL OUTFIT

When used as an annealing point, the cord of the pencil is attached to the top connection on the side of the instrument. The point is then replaced by one made of carbon, and the work is placed on the table of the instrument. When the current is turned on and the carbon point held on the work, the point of contact begins to glow with heat. In this way, a small spot can be heated without affecting the rest of the work.

The carbon point may be employed in the same manner for soldering, being held in contact with the work to heat it and cause the solder to flow. The outfit is operated from an ordinary lighting circuit of 110-volt 60-cycle, alternating current.

American Foundry Equipment Co. Power Sand-Cutting Machine

The accompanying illustration shows a machine for use in foundries for cutting and tempering sand. It has recently been placed on the market by the American



"AMERICAN" TYPE HP SAND-CUTTING MACHINE

Foundry Equipment Co., 336 Madison Ave., New York, N. Y., and is similar in general construction to the machine described on page 779, Vol. 55, of AMERICAN MACHINIST. The recent model of the machine is equipped with an electric motor for moving it by power, and is designated as the Type HP machine.

The frame is made of seamless steel tubing. The front wheels are of the caster type and mounted on inclined forks. The machine is steered in the same manner as a push cart. Spring mounting of the wheels enables compensation for unevenness in the floor. The drive wheels are of the tractor type, and are driven by a motor through gearing that engages with each wheel. The motor may be run in either direction and has two speeds, the fast one affording a travel of 45 ft. per minute and the slow one of 15 ft. per minute.

The cutting cylinder, shield, motor and transmission are carried upon a frame held in approximate balance. By tilting this frame, the cutting cylinder can be lowered into the sand. This operation is normally performed by means of the handwheel at the front of the machine, although the cylinder may be quickly raised independently of the wheel in case of emergency. The cutting cylinder is driven by a 2-hp. motor. Current is brought to the motors through a flexible cable that may be attached to any convenient plug.

The machine may be employed for mixing core sand and facing sand, as well as molding sand. It performs the entire work of blending, mixing and tempering without the aid of any accessory mechanism, and may be employed to pile the sand or throw it into windrows. The total length of the machine is 91 in., and the width 63 in. The clearance above the floor is 22 in. and that between the wheels 55 in. The length of the cutting cylinder is 44 in. Weight, 1,500 pounds.

Wayne Portable Oil-Burning Forging and Rivet-Heating Furnace

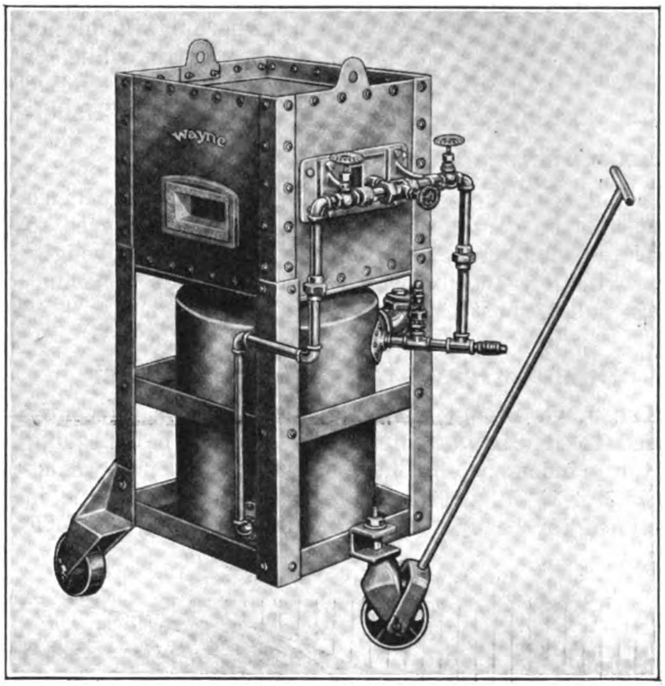
The portable oil-burning forging and welding furnace shown in the illustration has recently been developed by the Wayne Oil Tank and Pump Co., Ft. Wayne, Ind., for shops where it is necessary that the forging or rivet-heating equipment be moved about in order that the work may be more speedily and easily accomplished. The furnace is substantially but lightly made.

The furnace is approximately 51 in. high over-all, 25 in. from front to back, and 31 in. wide. The handle is 40 in. long and attached to the guiding castor. The furnace body is made of 14-gage black iron, held by heavy angles, and is 16 in. high, 18 in. wide and 16½ in. from front to back. The work opening is 6 in. wide, 3 in. high at the edges and 4 in. high in the center. The working space is 9 in. wide and 7 in. deep, exclusive of the tile opening, which is 5¾ in. from front to back.

The supporting frame which surrounds the tank is made of heavy angles. The tank itself, which is flame welded, is constructed of black iron with a $\frac{3}{16}$-in. shell and ¼-in. heads. The tank will withstand a working pressure of 100 lb. per square inch. It is 17 in. in diameter and 22 in. long, and has a capacity for 14 gal. of fuel, which is sufficient for 10 hr. of normal operation. The tank is fitted with a safety valve. The 2-in. air-tight filling opening is conveniently located.

The parts of the heater are conveniently arranged, with but few wearing parts to require replacement. Other than the fire-clay combustion chamber there is practically nothing that must be renewed as a result of usage. The fire-clay shapes are simple and may be quickly renewed.

Air pressure is obtained by connecting the furnace to the compressed-air line which supplies the riveting



WAYNE PORTABLE OIL-BURNING FURNACE

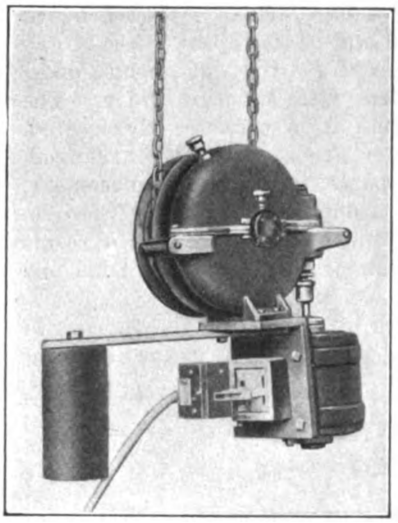
hammers. After the burner has been once adjusted to the air pressure used, it will require practically no further attention. The shipping weight of the furnace is 600 lb.

New Jersey Foundry and Machine Co. "Handiman"

The device shown in the accompanying illustration has recently been placed on the market by the New Jersey Foundry and Machine Co., New York, N. Y., for operating hand-power hoists of 5-ton or larger capacity. It is an electrically driven machine that may be suspended in the bight of the operating chain. It has a capacity to overhaul 138 ft. of chain per minute, with a chain pull of 150 lb., thus overhauling the chain about four times as fast as a man can do it.

The machine consists of a cast-iron housing in which is contained a hardened worm and worm gear running in oil and driven by a $\frac{3}{4}$-hp. motor attached to the frame. The worm-wheel shaft carries a grooved sheave with a rubber tread. This tread is V-shaped, will fit any size and pitch of operating chain and gives sufficient tractive effort to prevent slipping. The machine is counter-balanced, so that it hangs with the center of gravity in the plane of the operating chain.

Current may be supplied by a flexible conductor from a convenient lamp socket. Mounted on the machine is a plug socket for attaching the flexible conductor, and a reversing switch that enables the motor to be run in either direction.



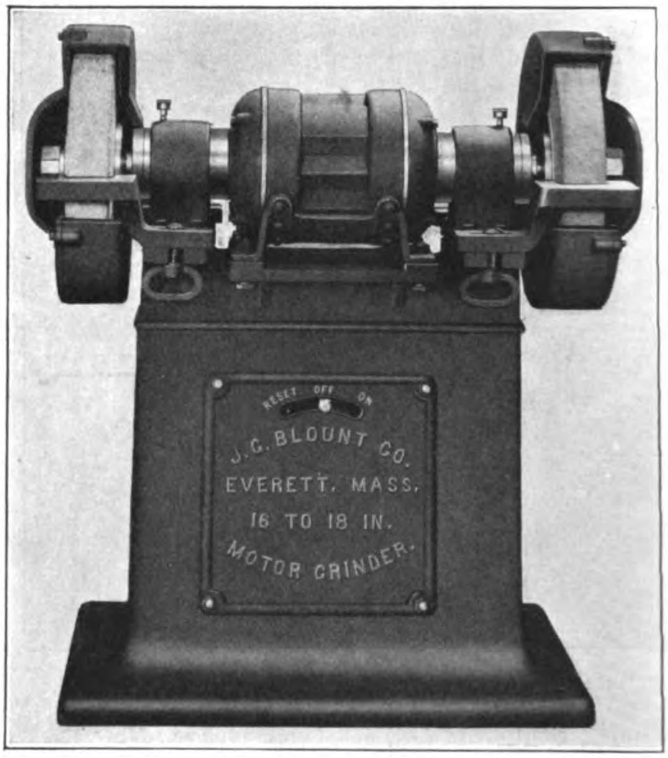
"HANDIMAN" CHAIN-HOIST OPERATOR

The machine is intended for use on hand-operated equipment where it is desired to obtain faster and easier operation than is obtainable by hand, and where it would not be worth while to install an electric hoist. The "Handiman" is not a hoist itself, but simply a portable machine that may be carried from place to place and used to operate a number of hand hoists. The machine weighs approximately 165 lb., which is in excess of the hand-chain pull of most hand-operated hoists.

Blount Heavy-Duty Motor Grinder

The J. G. Blount Co., Everett, Mass., has recently added to its line of alternating current ball bearing motor grinders a 5-hp. heavy-duty machine for wheels 18 x 3 x $1\frac{1}{2}$ in. or 16 x 3 x $1\frac{1}{2}$ in. The machine is designed for heavy work and built accordingly. SKF bearings are used throughout and the spindle is of 45-point carbon steel.

The end shields are of cast iron, turned with a recess and bolted directly to the motor frame. They are further secured in position by supports clamped around the end shield hub and then bolted to each side of the head



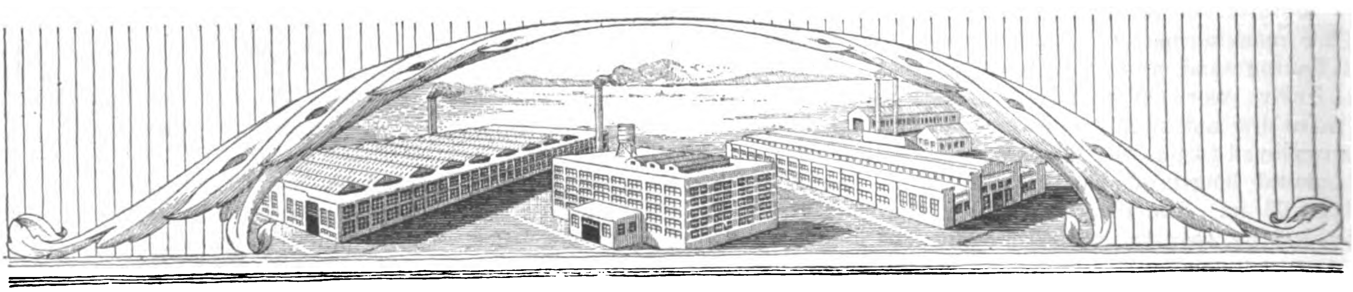
BLOUNT HEAVY-DUTY GRINDER

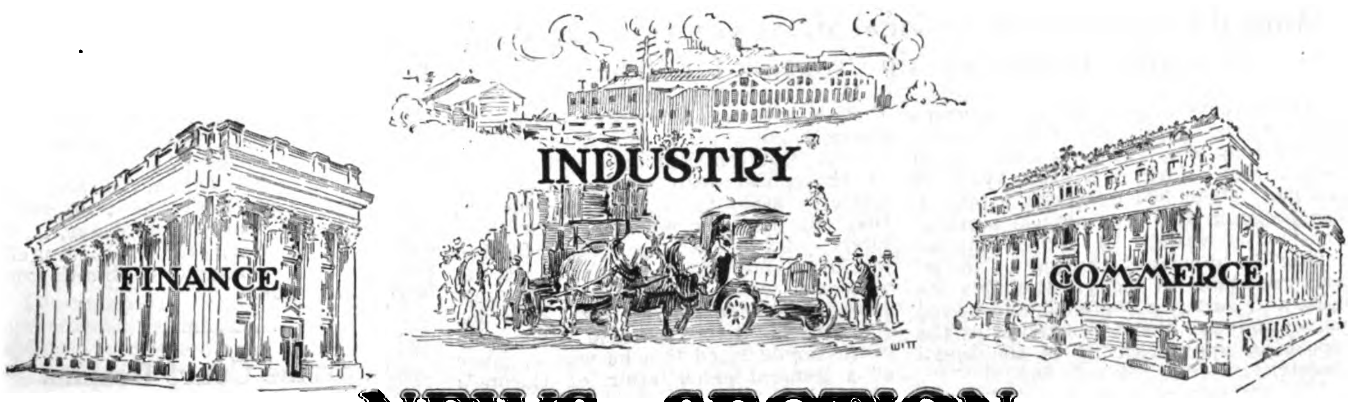
casting. The end shield flanges are turned and threaded into the ends of the shields. The flanges are machined all over and recessed on the inside.

Wheel guards are furnished, either plain or of the exhaust type, and are adjustable. Removable covers enclose the sides of wheels, flanges, nuts, etc., for safety protection. The work supports are so mounted that their positions are adjustable.

The starting switch is a Westinghouse No. 815 safety type, mounted within the column on a separate panel, and easily removable from the rear of the machine, without disconnecting the switch. The switch protects both operator and equipment against unexpected restarting and accidental starting of the motor. It cannot be held closed on overload and has a long life under severe operating conditions.

The machine is furnished as follows: 5-hp., 220 or 440 volts, 60 cycle, 2 or 3 phase, or 550 volts, 60 cycle, 3 phase. The weight of this machine is about 1,200 pounds.





NEWS SECTION

Mechanical Engineers at Atlanta Next Month

The spring meeting of the American Society of Mechanical Engineers will be held in Atlanta, Ga., from May 8 to 11, with headquarters at the Piedmont Hotel. The technical program is said to be one of the best ever prepared for such a meeting. Seven of the sessions have been planned by the professional divisions of the society, these sessions to be held on the mornings of each of the convention days.

The textile division and the machine shop practice division have co-operated in two sessions which will deal with textile machinery. The materials handling division will present a paper on material handling equipment as used in the iron and steel industry. This paper will give the results of an intensive study of this subject by a special committee, and will furnish a remarkable opportunity for the discussion of the best methods for handling the many materials used in the steel industry. There will also be sessions on fuels, management, power, welding, and two interesting general sessions. A valuable paper on turning exhaust losses into work in reciprocating engines has been prepared by Dr. Johann Stumpf, who will present it in person. A public hearing will be held on the power test codes, at which a discussion on definitions and values, displacement compressors and blowers will be permitted. The boiler code committee will also hold a meeting.

The usual entertainment features of the spring convention will afford the delegates plenty to do in their leisure moments. Special provisions have been made to entertain the ladies while the men are attending the meetings.

Tap Drill Sizes

Recently a meeting of the National Screw Thread Commission was held at the Bureau of Standards, Washington, D. C., at which consideration was given to the question of tap drill sizes to be recommended for producing holes in conformity with standards adopted by the commission. It was voted to recommend drills of a diameter midway between the maximum and minimum minor diameters of the tapped holes already established. These limits result in a thread in the nut of from 75 to $83\frac{1}{3}$ per cent full depth, with a mean value of $79\frac{1}{6}$ per cent full thread depth.

Department of Commerce Not to Aid Open-Price Associations

Trade association practices that come under any suspicion whatever constitute such a small percentage of the benefits accruing from the work of these organizations, that there is no justification for the continuance of questionable activities. This point was brought out strongly at the Trade Associations Conference held at the Department of Commerce on April 12. It was shown that only seventy out of 3,000 organizations can be classed as open-price associations. Even among the open-price associations the opinion was expressed that 90 per cent of the benefits to members come from other activities and that these benefits are greatly exaggerated.

While it was brought out clearly at the meeting that the legality of open-price statistics has not been passed upon, and that associations doing such work cannot be denounced as law breakers, particularly when their figures are made public, yet it was made perfectly plain that the Department of Commerce will not co-operate with that type of organization. No one will be surprised if the Department of Justice should institute proceedings against such associations. At any rate, the Department of Commerce is not going to jeopardize its usefulness to other trade associations by co-operating with those who are operating within the twilight zone.

The Department of Commerce has on file a long list of the constructive things which trade associations can do. The list is growing. It is believed that its growth will be accelerated as trade associations realize that they have been covering only a portion of their field. Heretofore, attention has been concentrated largely on matters intended to accelerate production. Very little has been done toward improvement in distribution—an area thought to promise much. Sight also seems to have been lost of the fact that no restraint of trade is involved when buyers and sellers get together. Were trade associations to arrange for committees of buyers to confer with committees of sellers, it is believed that much waste could be eliminated and the spread between the price obtained by the producer and that paid by the ultimate consumer could be narrowed materially.

Trade Excursion to Mexico for Business Men

Business men who are interested in the future development of our trade with Mexico, are being offered an excellent chance to study that subject through a personally conducted tour of the Southern republic under the auspices of the *New York Commercial*. The excursion will leave New York on May 7 and will return on June 2. Stops will be made en route at Atlanta, Ga., New Orleans, La., Houston and Brownsville, Tex.

In Mexico the party will visit all the important industrial centers, to inspect plants, public works, harbors and the oil fields. Extended stops will be made at Monterrey, Tampico, San Luis Potosi, Aguascalientes, Guadalajara, Lake Chapala, Cuernavaca and Puebla.

The expedition will be accompanied by Dr. W. E. Aughinbaugh, well-known authority on foreign trade, and John F. Barry, editor of "Commercial Mexico."

Farm Machinery and Tool Prices Decline

The average of prices for farm equipment was 1.6 per cent lower on Feb. 15, than on Jan. 15, according to a survey made by the United States Department of Agriculture. The decline since Feb. 15, 1921 is 20.2 per cent.

The declines for the month were most pronounced in the case of machinery and tools such as tractors, cream separators, harrows, lumber, mowers, scythes, and wheelbarrows.

Foreign Trade Convention

The revised program for the ninth annual convention of the National Foreign Trade Council, which is to be held in Philadelphia, May 10, 11 and 12, has been received. The group sessions will include topics on advertising, credits, price quoting, protection, exchange losses, ocean transportation and general European conditions. The main theme of the convention will be the financing of foreign trade and a study of the merchant marine problem. The speakers have been selected with great care from among export managers, credit managers, treasurers and advertising executives. The general sessions will be held in the Academy of Music and the group sessions in the Hotel Bellevue-Stratford.

Annual Convention of National Metal Trades Association Features Apprenticeship Program for Industry

The twenty-fourth annual convention of the National Metal Trades Association was held at the Hotel Astor, New York City, on April 19 and 20. About 300 delegates attended. The program for the technical sessions provided a variety of subject matter having an important bearing on industrial conditions of today. Probably the most noteworthy accomplishment of the convention was the presentation of the report on apprenticeship in the metal trades.

This report was prepared by the committee on industrial education, of the association, after an exhaustive and intelligent study of this subject which took them into all phases of the metal-working industry. The committee was headed by Harold C. Smith, president of the Illinois Tool Works. He was assisted by W. M. Taylor, president, Chandler & Taylor Co., and John C. Spence, of the Norton Company. Philip C. Molter, superintendent of the industrial education department of the association also assisted in this work. The report gives a thorough survey of the industrial educational courses provided by the metal-working industries in this country. The good points of each were combined into a comprehensive program of apprentice training, and it is the plan of the association to have this program adopted throughout the industry and in that way develop a standardized system of training which will have a beneficial effect on the industry as a whole. The plan was presented by the committee and discussed at some length, but no final action was taken at this meeting.

One of the most interesting and timely addresses of the whole convention was delivered at the Wednesday afternoon session by Harold G. Moulton, professor of political economy in the University of Chicago. His subject was "American Industry and the Stabilization of Europe." Prof. Moulton presented a study of European conditions and an analysis of their effect on the business of the United States. He dwelt at some length on the Genoa conference and explained what its hopes had been before the discovery of the treaty between Germany and Russia, and the probable effects which that treaty would have on the final outcome of the conference. He said that the signing of this treaty was proof of the suspicions of France that Germany was not conquered, and was a justification of her insistence in being guaranteed protection by the United States and Great Britain. He said that it was the German idea to beat the Allies to it in Russia in case the Genoa conference gets them nothing; that if the conference at Genoa was a failure it would mean a resumption of the race for military supremacy in Europe, and might eventually lead to another conflict such as we have just experienced. He declared that the British policy in handling the German reparations was fundamentally sound in principle, and that it was Great Britain's desire to restore the economic stability of both Germany and Russia. Germany is the economic pivot of continental Europe and has been the leader of the industrial growth on that side of the water. He blamed the industrial stagnation of British industry today on the loss of German markets.

Prof. Moulton then showed the effects of these European conditions on the economic stability of America. He said that our domestic markets were absolutely dependent on our foreign markets, and that we could expect no progress while international markets were disorganized. His audience showed no little surprise when the professor declared that he was in favor of a general cancellation of Europe's war debts to the United States. He said that this was the only way out of the industrial and political chaos of today. He gave three possible remedies for our present industrial ills; a readjustment of exchange rates, abolishment of the too numerous trade regulations and barriers, and a reconsideration of the reparations payments, with a possible cancellation of the war debts.

An interesting presentation of the agricultural situation was given by A. M. Loomis, of the Washington office of the National Grange, whose subject was "The Farmer as a Balance Wheel." Mr. Loomis explained the origin and the growth of the recent farmer movements in this country, including the agricultural bloc in Congress. He pleaded for a greater recognition of the farmer and his problems, and predicted a greater prosperity for the nation when this was brought about.

The banquet on Wednesday evening was well attended. The speakers were: Former United States Senator Charles Thomas, of Colorado; Dr. W. H. E. Faunce, president of Brown University; and Howard E. Coffin, of the Hudson Motor Car Co.

On Thursday only two papers were presented. L. F. Loree, president of the Delaware & Hudson Railroad, addressed the convention on "Relations of the Railroads with Their Patrons." In his remarks the speaker touched on some of the abuses in transportation which he said were helping to keep the railroads from attaining their highest efficiency. He said that 1921 was the worst year in the history of the railroads of the United States. During that year railroad business decreased 30 per cent below the previous year, which was a drop of 20 per cent more than during any other depression. But he predicted that this year business would pick up at least one-half of this loss, though even then it would still be less than other years.

The other address was delivered by E. L. Greever, of Tazewell, Va., who was counsel for the non-union coal operators of West Virginia during the "insurrection" of last September. Mr. Greever gave a first-hand and intimate story of the march of the organized miners on the non-union forces. He characterized this as a "treasonable insurrection" and declared that it was financed and promoted with the knowledge of the officials of the United Mine Workers of America. He decried against the methods used by the labor unions to exact obedience from the union miners, and said that the non-union fields of West Virginia were the greatest bulwark against the encroachment of union domination of the coal industry.

The election of officers for the ensuing year closed the convention. W. W. Coleman, of the Bucyrus Company, was elected president; J. B. Doan, of the American Tool Works, first vice-president; Paul C. DeWolfe, Brown & Sharpe, second vice-president; J. W. O'Leary, Arthur J. O'Leary & Son Co., treasurer. Councilors for two years are: Albert J. Ford, E. J. Miller, A. J. Gifford, J. D. Cox, Jr., W. R. Angell, Jos. F. Cooley, Harold C. Smith and Harold Edwards.

Supreme Court Decides Against Shoe Machinery Company

The Government has won its case against the United Shoe Machinery Corporation. In the Supreme Court on April 17 Justice Day delivered the judgment of the court that the leases executed by that company with users of the machinery contained certain clauses, terms and conditions which were in violation of the Clayton Act of Oct. 15 ,1914. The court affirmed the decree of the District Court of the U. S. for the Eastern District of Missouri, that these leases were violative of the law in that they tended to monopoly.

The Supreme Court in its opinion held that Section 3 of the Clayton Act makes it unlawful for persons engaged in interstate commerce "to lease machinery, supplies or other commodities, whether patented or unpatented, for use, consumption or resale in the U. S., or to fix a price therefor, or to discount from, or rebate upon such price upon the condition agreement or understanding that the lessee shall not use or deal in the machinery, supplies or other commodities of the competitor or competitors of the lessor, where the effect of such lease, agreement or understanding may be to substantially lessen competition or tend to create a monopoly."

The effect of the decision is to enjoin the United Shoe Machinery Co. of Maine, the United Shoe Machinery Corporation and the United Shoe Machinery Co. of New Jersey, from making leases containing certain clauses, terms and conditions requiring the sole use of these machines.

Navy Sending Text Books to Engineering Schools

The bureau of engineering, of the Navy Department, is furnishing the engineering schools of many of the colleges of the country with copies of its general specifications for machinery. These specifications represent modern practice in naval engineering, and with their several appendices describing methods of inspection, etc., are practically textbooks on this highly specialized subject. There are very few colleges that have regular courses in marine engineering, and during the World War special schools were established for the instruction of the personnel required to man the vessels operated by the Navy. As the conditions obtaining on a naval vessel are very different from those found in power plants ashore, the specifications are of considerable value for instruction purposes.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

The breezes are freshening. The sea is somewhat rougher and the ship of business is commencing to toss a little, although she is moving with greater speed. The barometer is rising, but a gale is possible even with a rising barometer, and the careful navigator will now be ready to shorten sail if it blows too hard.

On the New York Stock Exchange trading has become very active. Two million shares changed hands last Monday, but on Tuesday, when the market seemed strongest, its strength suddenly turned to weakness concurrently with the announcement that the Republican caucus in the Senate had voted to pass some sort of a bonus bill this session.

There may have been no relation of cause and effect between the action of the caucus and the decline in the stock market, but the coincidence shows the need of caution in an excited market, and though much of the decline has been recovered there are a few gathering clouds that should be watched.

One of them is the coal strike. As it continues without any real effort at settlement or conciliation the feeling is becoming more bitter and it may flare up in some attempt at violence that will shock the nation.

Another is the New England textile strike. It is becoming an obstinate and sullen fight that must be causing much loss to capital and great distress to labor.

An Evil Combination

Still another is the treaty between Germany and Soviet Russia which has nearly disrupted the Genoa Conference and has shocked Europe. Taken in conjunction with the report that Germany has agreed to lend Russia the equivalent of 23,800,000 gold dollars to be spent for German goods the treaty is construed as notice of an economic alliance between the two political Ishmaelites of the world whose power for evil in combination is supposed to be great and might have to be restrained by another war which, as Lloyd George says, would leave Europe a heap of ashes.

And finally there is the bonus bill already referred to. In whatever form it becomes law and however it may be sugar-coated it means an increase of taxes or more government loans. As these are the two things that business men are most afraid of it is not surprising that the money market is a little firmer and Liberty Bonds a little weaker. The feeling of apprehension thus reflected has been somewhat intensified by Secretary Mellon's figures indicating a Treasury deficit of $484,000,000 for the fiscal year ending June 30, 1923, but it would be unfair to charge the steadier money market and the decline in Liberty Bonds entirely to the bonus bill. Stock brokers are increasing their loans and their operations are commencing to make some impression upon the loanable surplus of the banks.

As might have been expected under these circumstances the reserve ratio of the Federal Reserve System has declined slightly despite an increase of $5,000,000 in the gold held. It now stands at 77.3 as against 77.7 per cent a week ago. The result is a slight hardening in the rate for commercial paper, which sold as low as 4¼ per cent early in the week when the oversubscription on the 3¾ per cent Treasury certificates was announced.

Money Still Easy

These developments lead me again to advise prospective borrowers to take advantage of the present ease in money to cover their requirements as far ahead as possible. According to the Federal Reserve Bulletin for April $913,303,000 foreign dollar loans were issued in the United States between Jan. 1, 1921 and March 15, 1922. Of this total $263,000,000 was issued this year, and since March 15 a good many more large loans have been floated. The total of the domestic loans concurrently placed. including state and municipal bonds, must be much greater. Some authorities estimate that the aggregate of new and refunding bonds sold in the last fifteen months is over four billions.

A large portion of the money thus raised is still in the banks, but it was borrowed to be spent and when it is in circulation rates will probably be higher. For this reason it is likely that Liberty Bonds are about as high as they will go at present. They sell in direct relation to the money market and when they are at or near par the present Secretary of the Treasury, who is very canny, may postpone further buying for the sinking fund.

There is, in fact, some indication that the whole bond market, including taxables as well as non-taxables and government issues, is in a condition of satiety. It has been the fashion of late to describe it as insatiable, though everyone knows that such a condition can never last very long and that repletion and flatulence often follow overeating. As to stocks it is anyone's guess. Many of the industrials seem high enough but the railroad shares that represent the equity in and control of our transportation system have a strategic as well as an intrinsic value in combination that are not yet fully realized and will not be appreciated until the inevitable consolidations for which the Esch-Cummins bill provides are seriously undertaken. This is, however, a long distance view and the stock market, including railroad shares, will continue to be "fluctious" in the interval and afterward.

Geographically viewed the Pacific Coast States are still the most cheerful part of the country, and Southern California is especially elated by the prediction that a new vessel shortly to be put in service between New York and Los Angeles will make the voyage in eleven days. The railroads are taking notice and are advertising a drastic reduction in transcontinental passenger rates for the summer. The outlook in Canada is also improving and much speculative excitement is reported over the alleged discovery of oil in Alberta.

Of the commodity markets and distributive trade in general there is not much new to say. Wheat futures suddenly jumped up several cents a bushel when the trade became conscious that most of the existing supply had been hedged and that the hedges would have to be bought in as the grain is sold. Cotton has also been firm as the strength of the statistical position became apparent. Coffee has been almost buoyant as the trade and the public have come to an appreciation of the conditions to which attention was drawn in these letters some months ago.

The steel industry is almost booming. Copper is in better demand. Tin is higher and rubber is up about 2½ cents a pound since attention was first called to its cheapness in this letter. The advance is traceable to the increased demand for tires, which in turn reflects an improvement in the automobile business. Silk is firm and higher. Wool is quiet but firm.

Optimism on Wall Street

In so far as it is communicable it would appear that the optimism which prevails on the Stock Exchange is gradually infecting and affecting business generally. Upon this theory it is to be expected that wholesale and retail merchants will find themselves getting busier as the boom in stocks nears its perihelion. A continuous and general increase in building activity is again reported in nearly every section of the country.

Progress in the reorganization of Mexico's finances is indicated by the reports from the bankers' conference now being held in Paris, and the Greek banks which were closed by the monetary panic in that country have reopened.

Despite the news from Genoa the London Stock Exchange has been "firm on easy money" and foreign exchange is generally higher. Even German marks are slightly higher though the total outstanding is now 131,837,249,000, which is an increase of over a billion for the week ending April 7. As suggesting what may happen unless the German presses printing marks are stopped, attention is called to the situation in Russia, where it takes 75,000 rubles to pay a street car fare and the amount of paper money in circulation runs into the quadrillions.

Industrial Developments in France

BY C. E. CARPENTER
President, C. E. Carpenter Co., Société Anonyme, Paris

Business in France in the metal-working industries continues to show an improvement over 1921, although cases of marked progress are not plentiful. The improvement is confined principally to what is known as the *petite mécanique*, as distinguished from the *grosse métallurgie*, among which are classed the blast furnaces, steel mills and the makers of heavy manufactured material. In the *grosse métallurgie* the stagnation is reported to be acute, with few or no signs of a possible early amelioration.

Just how much this is due to the reduction in naval armaments it is difficult to state, but one prominent manufacturer recently expressed the opinion that the new policy of reduction in naval armaments will have serious consequences for the metal-working plants in France, which, in the past, have depended to a great extent upon navy orders to keep their plants in operation. As he expressed it, France has always had in course of construction a certain amount of tonnage in battleships, cruisers, destroyers and submarines, not only for her own needs but for those of other countries as well, thus providing a large amount of work for the rolling mills, the engine builders and boilermakers, the electrical shops, bolt makers and a score of other industries. As these orders are to be greatly restricted in future, it will be very difficult for the plants that formerly looked to them as their main source of business to find work for the capacity thus released, particularly in the face of the impoverished condition of the world and the active competition of Germany, Belgium, Great Britain and the United States for such foreign business as is offered. The railways cannot well be looked to for the tonnage needed to take the place of the reduced navy purchases, although the electrification plans now well under way will help considerably by distributing orders throughout the country for a large number of electric locomotives, turbines and other equipment.

Big Export Combination Formed

Under the circumstances, therefore, it seems that if France is to keep her mills and great metal-working establishments properly employed, it will be necessary for her manufacturers to take energetic steps to secure a much larger amount of foreign business than they have sought heretofore. That some of the manufacturers realize this is evidenced by the recent formation by the Aciéries de Longwy, together with a group of other mill owners and manufacturers, of an exporting company known as Longovica, Compagnie Industrielle et Commerciale d'Exportation, with a capital of twenty million francs. The headquarters of the new company are in Paris and the subscribers to it are: Electro-Métallurgie de Dives, Ateliers de Construction du Nord de la France (Blanc Misseron), Société Louvroil et Recquignies, Ateliers de Forge et d'Estampage de Vieux-Condé, Société Métallurgique de Gorgy, Aciéries Gouvy de Dieulouard, Renault (the well-known automobile builder) Société Rateau (turbines and pumps), Forges et Ateliers de Commentry-Oissel and Société des Constructions et Grandes Entreprises de France. All of these concerns are leaders in their particular fields and the association of so powerful a group, backed by ample capital and credit facilities, should make it possible for a great French selling organization to be built up throughout the world.

In the *petite mécanique*, in some industries a very considerable improvement is noticeable. In St. Etienne, for example, the manufacture of bicycles is running to capacity, fully employing not only the recognized bicycle plants but practically all the parts makers as well. In all the establishments overtime is the rule, and it is estimated that this year's output of bicycles will exceed the best year yet known. Bicycles are being shipped in large numbers to foreign countries, even Belgium being a heavy buyer of French makes. It is reported also that there is a growing demand for Browning pistols and that the makers of these arms are speeding up their capacity. This, coupled with the manufacture of shot guns and hunting rifles, is an important industry in St. Etienne and a revival in the demand means a substantial reduction in unemployment in that section.

Still Making Firearms

In Paris, it is reported that another branch of the firearms industry has succeeded in closing a substantial foreign contract, the Hotchkiss Company being credited with having received an order from a South American country for machine guns to the value of sixty-five million francs. If the report proves to be correct, and there seems to be no reason to doubt it, the order will provide several years of work. Following the armistice, the Hotchkiss Company, which during the war operated a large plant at Lyons from which it furnished many thousands of machine guns to the A. E. F., acquired the fine new plant in the outskirts of Paris built by Clerget-Blin for the manufacture of aviation motors. The plant has been rapidly converted for the manufacture of machine guns. The running of this plant at full capacity should provide employment for several hundred men now out of work. The operating head of the Hotchkiss Co. is a well-known American engineer, Laurence V. Benét, who is one of the most prominent members of the American colony in France and a founder of the American Chamber of Commerce.

Automobile Business Improves

Another industry that indicates a satisfactory state of improvement is the manufacture of light-weight, low-consumption automobiles. The plant of André Citroen, which will be remembered during the war as a model of efficiency in shell making, is reported to be operating at maximum capacity on the 10 hp. model car, sixty cars per day being regularly turned out, with all cars sold in advance. A smaller car is being brought out by the same firm and will shortly be manufactured in the Clément-Bayard plant at Levallois-Perret, a few miles from Paris, this plant having recently been acquired for this purpose. The new car is a 5 hp. model and it is stated that the Citroen interests have already in hand orders amounting to approximately two hundred million francs for this model alone. Other car builders have likewise lately placed on the market new models of light weight cars and judging from the increasing numbers of these cars seen on the streets and highways the public has opened its purse to the newcomers in a generous fashion. A low-powered small car can now be purchased for 8,500 to 9,500 francs, which brings it within the means of a large section of the population that has since 1914 been deprived of the luxury of an automobile. What is even more important, however, is the fact that the cost of operation of the small car is more within the means of the masses than the cars heretofore built in France. The new models are designed to give approximately 45 miles to the gallon of gasoline on the road and a correspondingly low oil consumption and tire expense. The high cost of these items in France during the past two years has done more than anything else to discourage the public from buying automobiles and to cripple the great French automobile industry.

The reports that are received from the northern part of France indicate that rapid progress in the reconstruction of the manufacturing plants destroyed by the Germans is being made. The great works at Blanc-Misseron, for example, have been almost completely rebuilt and it is expected that before the end of this month the first locomotive built by them since the war will leave the shops. Satisfactory progress is also being made on the construction of the 200,000 hp. electric power station at Comines, which with the exception of the station at Gennevilliers, near Paris, will be the most powerful station in France. It will utilize the coal near the mines and will be of great help to the north in getting under way again.

"Zamium" Plant at Boonton

A suitable plant for the manufacture of Zamium, the metallic alloy invented by Lawrence Zamboni, will be erected at Boonton, N. J. The Zamium Corporation has been organized and incorporated, and production will start as soon as the factory is completed.

This alloy is said to be a reliable and a less expensive substitute for platinum. It is claimed for the alloy that it cannot rust, tarnish or corrode; is non-magnetic; can be cast, rolled or drawn, soldered or welded; is not affected by any kind of acid, alkali or sea water and has a tensile strength of 150,000 lb. per square inch.

The company will market the product in all forms for the manufacture of jewelry, cutlery, surgical instruments, marine hardware and engine and motor parts.

Officers of the corporation are: Lawrence Zamboni, president and treasurer; Ferdinand Rollini, vice-president; A. L. Zamboni, secretary.

The corporation retains a business office at 149 Broadway, New York City.

American Gear Manufacturers' Association in Buffalo—Interesting Reports—Sinram Re-elected President

The spring meeting of the American Gear Manufacturers' Association was held at the Hotel Lafayette, Buffalo, N. Y., on April 20, 21 and 22. The convention was opened by an address entitled "Over the Threshold of a New Era," by President F. W. Sinram. Following this, the usual reports were made by the respective officers and committee chairman.

F. D. Hamlin read the reports of the secretary and treasurer; F. F. Goedke on entertainment; George L. Markland, Jr., on membership; H. E. Eberhardt, on public policy; J. E. Gleason, for the legal committee; J. C. McQuiston, for the publicity committee; L. L. Nicholson, for tariff; and J. B. Foote, on industrial relations. After the reports had been received and acted upon, H. E. Harris read a paper on "Good Hob Practice." He advocated the use of hooked tooth hobs and demonstrated the action of various shapes of cutting edges.

The use of the projection comparator in testing gear teeth was shown by Ralph E. Flanders, a machine being set up in the meeting room and demonstrations made with both gears and gear cutters. This produced a magnification of about 100, and showed very interesting results. Discussion followed on the methods and equipment used.

The reports of the A. G. M. A. sectional committee of the Engineering Standards Committee was presented by the chairman, B. F. Waterman, who is also chairman of the general standardization committee of the association. Both of these reports showed progress along desirable lines. Mr. Waterman pointed out that it might, and probably would, be desirable to reconsider some of the proposed standards in view of suggestions brought out at the committee meetings. He showed the inadvisability of adhering to a proposed standard unless it was of such a nature as to make its adoption by other engineering bodies practical. In conclusion he suggested that whatever standard was finally adopted it should be a real American standard. rather than having various separate bodies establish standards of their own. Other reports were made by the spur gear committee, bevel and spiral bevel committee, herringbone committee, and the committee on gears and pinions for electric railways and mines.

Further proceedings included the reports by chairmen of committees on uniform cost accounting systems, J. H. Dunn; nominating committee, A. C. Gleason; nomenclature, F. E. Eberhardt; worn gears, J. C. O'Brien; inspection, J. C. Eppley; and composition gearing, John Christensen.

At a meeting of the industrial group, George L. Markland, Jr. presided. The topic was "Conditions in the Industry" and the discussion brought out some very favorable comment on present industrial relations. An informal banquet was held on the evening of the twenty-first at which President Sinram was toastmaster, and John C. Bradley, of the Pratt & Letchworth Co., the principal speaker. His topic was "What's Ahead" and was very interesting. After the dinner J. C. McQuiston exhibited a radio telephone and explained its construction and operation.

The program for the last day was of peculiar interest to gear manufacturers. The papers included "Proportions of Industrial Gears," by G. E. Katzenmeyer, of the R. D. Nuttall Co.; "Keyways," by Lars Nilson; "Sprockets," C. R. Weiss; "Metallography," C. B. Hamilton, Jr.; "Transmission," by A. C. Bryan; "Differentials," S. O. White; "Tooth Forms," H. J. Eberhardt. E. W. Baxter rendered a report for the library committee. Another session considered the industrial conditions from the automotive point of view.

In the afternoon the grinding of gear teeth and its future in the industry was discussed by R. S. Drummond of the Gear Grinding Machine Co. The Gleason Works system of bevel gears, which was shown at the meeting in Rochester last October, was further explained in detail by F. C. McMullen and T. M. Durkan. Abstracts of some of these papers will appear in later issues.

DOMESTIC EXPORTS OF METAL-WORKING LATHES, BORING AND DRILLING MACHINES FROM THE UNITED STATES, BY COUNTRIES, DURING FEBRUARY

Countries	Lathes No.	Lathes Dollars	Boring and Drilling Machines No.	Boring and Drilling Machines Dollars	Planes and Shapers, Slotters No.	Planes and Shapers, Slotters Dollars	Milling Machines No.	Milling Machines Dollars
Belgium					1	4,078	1	381
France			1	347	1	750		
Greece	1	150						
Netherlands			24	120				
Sweden	1	675						
Switzerland			12	60				
England			28	640			6	10,178
Scotland			1	1,200				
Canada–Maritime Provinces	2	409						
Quebec and Ontario	22	9,210	21	2,786	4	3,519	8	2,375
Prairie Province	2	13						
Canada–Br. Columbia and Yukon	1	1,850					1	200
Salvador			1	40				
Mexico	4	602	3	6,622			6	30
Cuba	1	1,740						
Dominican Republic	1	3,907						
Argentine			21	546				
Brazil	1	9,120						
Chile	3	2,021						
Colombia			1	4,461				
Peru			2	535				
British India							1	3,049
China	1	17						
Hongkong	1	651	2	315	2	1,022	1	1,376
Japan	3	5,156	9	18,167	2	2,704	3	6,202
New Zealand			1	373				
Total	44	35,521	127	36,212	10	12,073	27	23,791

Obituary

LEROY S. STARRETT, founder and president of the L. S. Starrett Tool Co., of Athol, Mass., died on April 23 at his winter home in St. Petersburg, Fla. He was 84 years old. Mr. Starrett was the inventor of many types of measuring tools and gages, and was known for his benefactions in the interests of his employees, with whom he maintained a close relationship.

WILLIAM A. GREAVES, SR., a founder of the firm of Greaves & Klusman, machine tool manufacturers of Cincinnati, Ohio, died at his home in Hyde Park on April 19. He was 60 years old. A few years ago Mr. Greaves, with his two sons, organized the Greaves Machine Tool Co., in Cincinnati, and he was its president at the time of his death.

CHARLES THOMPSON, drop forge manufacturer, died at his home in Fremont, Ohio, recently.

ELLIS M. BURR, president of the Burr Company, of Champaign, Ill., died in that city on April 3.

CURTIS B. HATHAWAY, one of the organizers of the General Motors and Chevrolet Corporations, died at Pinehurst, N. C., on April 5. He was 63 years old.

Peter Lowe, of Kempsmith Company, Dead

Peter Lowe, assistant secretary of the Kempsmith Manufacturing Co., Milwaukee, Wis., died April 13 at his home in Garrett, Ind. He had retired from active association with the company's sales department some time ago, due to failing health. He was 45 years old.

Mr. Lowe started his career in the machinery field as a machinist with the Gisholt and with the Nordyke & Marmon companies. In 1906 he entered the

PETER LOWE

employ of the Kempsmith company as head of the cost department. He was transferred to the sales department in 1911 and a few years later was appointed assistant secretary.

As a machine tool salesman Mr. Lowe enjoyed a wide acquaintanceship among machinery builders, who were deeply grieved on hearing of his death.

The Trend of Business Improvement—Plants Resuming

The American Locomotive Co. is arranging for immediate increase in operations at its Richmond, Va., plant, which has been running on a curtailed schedule for about a year past. The working force will be brought up to close to 1,000 men at an early date. The company has received an order from the Southern Railway for thirty locomotives of Mikado type, with cost to approximate $1,100,000.

The Columbia Motor Co., Detroit, Mich., has adopted a capacity operating schedule at its plant, and will increase production each month for the next quarter-year. During April the works will produce 600 cars; in May, 1,200 cars; and in June, 1,500 cars. It is expected to maintain the latter basis of operation thereafter.

The Fisher Body Co. is operating at full capacity at its plants at Detroit, Mich., with regular working quota, and has adopted a similar basis of operation at its Ohio works. At Cleveland the company has acquired a small body plant and will place it in service on a capacity basis at once.

The American Car and Foundry Co. is arranging for immediate increase in the working force at its plant at Buffalo, N. Y., and proposes to more than double the present number of men within sixty days. Orders for freight and other cars received by the company during the past few months totals 7,000 cars, of which 2,000 will be constructed at the Buffalo works. An order has just been booked for 1,000 freight and refrigerator cars for the Northern Pacific Railroad, to cost about $2,300,000.

The Atchison, Topeka & Santa Fe Railway Co. is increasing the working force at its shops at Temple, Tex., and will soon be operating at close to normal.

Following an increase in production at the plant of the Saxon Motor Car Co., Detroit, Mich., arrangements are being perfected for the operation of a new works at Ypsilanti, Mich., where the plant of the Apex Motor Co. has been leased for a period of three years. The initial production will be on a basis of fifteen automobiles per day, giving employment to approximately 200 men.

The Colorado & Southern Railroad, Denver, Colo., is planning for the purchase of 200 new refrigerator cars and 1,000 steel gondola coal cars, to cost $1,425,000. The company is increasing operations at its shops for locomotive and car repair work. A large portion of the new shops to be constructed at Denver, by the Chicago, Burlington & Quincy Railroad, Chicago, Ill., the parent organization, will be used for Colorado & Southern work. The plant will consist of a number of one-story buildings, comprising machine shops, locomotive repair shops, wheel works, car and bolster works, estimated to cost close to $1,500,000, including equipment. Erection will be commenced at an early date.

The American Bearing Corporation, Indianapolis, Ind., is arranging for immediate increase in manufacture of automobile bearings, and will occupy a one-story plant on Tenth St., recently acquired. The works will be equipped at once, and the present factory at 212 West McCarty St., discontinued. The company comprises a reorganization of the American Bearing and Die Casting Corporation; Arthur Dixon is president.

The American Cast Iron Pipe Co., Birmingham, Ala., has developed production to a point of close to normal, with full working force. The National Cast Iron Pipe Co., in this same district, has also increased operations to capacity.

The Glasgow Iron Co., Pottstown, Pa., has resumed production at its local mill, following a shut down for many months past. The local puddling furnaces of the company have also been started up.

The Texas & Pacific Railroad Co. will increase operations to capacity at its shops at Marshall, Tex., for the rebuilding of a large number of freight cars.

The Stewart-Warner Speedometer Corporation, Chicago, Ill., has increased production at its plant from 4,200 speedometers to 5,700 units per day, or more than six times the low record output in 1921. In the tank department, operations have been advanced from 4,000 to 4,800 units daily.

The Lima Locomotive Co., Lima, Ohio, has received orders for forty locomotives from the New York Central Railroad, and for thirty locomotives from the Mobile & Ohio Railroad. The company has contracts on hand to insure capacity production for a number of months to come.

The Reynolds Spring Co., Jackson, Mich., is planning for extensive increase in production, and during the next sixty days will add about 500 men to the working force, increasing plant facilities to provide for the expansion. The company has received an order from the DeForest Radio Telephone & Telegraph Co., New York, for radio equipment to an amount of about $5,000,000. Expenditures for raw and finished materials for manufacture will approximate about $190,000, during the coming month.

The Durant Motor Co. of Michigan, Lansing, is arranging for an immediate increase of about 60 per cent in its working force, for the production of the Durant and Star automobiles. Work will be commenced at once on the erection of two additions to the plant, to provide for double the present capacity. Upon completion, production will be on a basis of 600 cars a day of both types.

The J. G. Brill Co., Philadelphia, Pa., has received a contract from the Boston Elevated Railway Co., Boston, Mass., for 100 steel passenger cars. The company has also take an order for fifteen traction cars for the South Bend, Ind., Railway.

The McClintic-Marshall Co. is increasing production at its structural steel works at Pottstown, Pa., and a number of additional employees will be added to the working force. The Shoemaker-Satterthwait Co., operating a similar local plant, is also increasing its production schedule.

The Pennsylvania Railroad Co. has increased the working force at its Altoona, Pa., car shops to a point of close to normal, and a double-shift operating schedule has been adopted in the steel car shops.

The Spicer Manufacturing Co., South Plainfield, N. J., manufacturer of automobile axles, universal joints, etc., has increased its working force to about 1,000 men at its local plant. The company has reopened its branch plant at Pottstown, Pa., which has been closed for about six months past.

The Jordan Motor Car Co., Cleveland, Ohio, now operating on a basis of forty cars per day, is arranging for a production increase early in May, to continue for an indefinite period.

Following the purchase of the plant of the A. W. Case & Son Manufacturing Co., Kensington Ave., Buffalo, N. Y., by the Richardson & Boynton Co., Dover, N. J., manufacturer of stoves, ranges, etc., the new owner has plans under way for a large increase in production. New buildings will be erected and equipped for the manufacture of stoves flanges, fittings, etc. Present operations, in the meantime, will be on a capacity basis. The Case company, manufacturer of a kindred line of stove parts, will remove the Kensington Ave. works to its other plant in the city.

The Middletown Car Co., Middletown, Pa., a branch of the Standard Steel Car Co., Pittsburgh, Pa., is increasing operations at its plant, and will soon develop capacity on an order for the Philadelphia & Reading Railroad Co., for 500 steel hopper cars.

The Deister Machine Co., Fort Wayne, Ind., reports that it has received more orders during the past few weeks, than in the entire year of 1921. The company manufactures mining machinery.

Car Surplus, Shortage and Freight Loadings

Reports of the car service division of the American Railway Association show that revenue freight loaded for the week ending April 1, 1922, totaled 827,011 cars a decrease of 19,024 cars from the preceding week, but 163,840 cars more than were loaded in the corresponding week of 1921. Compared with 1920, the report shows 31,816 cars less.

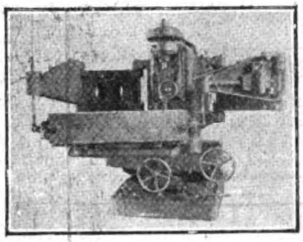
Grain, grain products, live stock and forest products all show some reduction in loadings compared with the previous week. Coal loading, which includes that loaded on the first day of the miners' strike, shows a decline of 19,634 cars, but is far in excess of the figures for the same period in the two previous years. Coke and ore show small increases; merchandise shows a gain of 1,911 cars, and miscellaneous 667 cars, the smallest gains made in these two classifications for some weeks past. All districts contributed to the decrease in loading compared with the week ending March 25 with the exception of the Pocahontas and the Northwestern districts. The slight gain in the Pocahontas district is largely in miscellaneous, while in the Northwestern district coal, forest products and miscellaneous show moderate increases.

Serviceable surplus cars totaled 206,746 for the week ending April 1, or 12,737 cars less than for the week ending March 23. Of these, 88,491 were box cars, 72,566 gondolas and the balance miscellaneous. Compared with the previous week box cars increased 1,038, while gondolas decreased 13,198.

Condensed-Clipping Index of Equipment

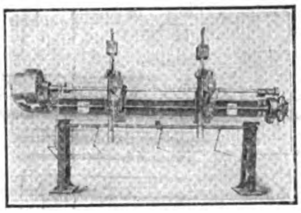
Patented Aug. 20, 1918

Die-Sinking Machine
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," Jan. 5, 1922



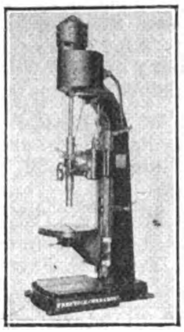
By the "Bayrer's compensating arms," a die weighing 4 tons may be suspended on elevating screws, swiveled, tilted or turned on edge. There is a rapid traverse for the quick adjustment of the head. Speed and feed changes are made by levers in front. Hand and power feeds are provided for both the longitudinal and crossfeeds of the table and a rapid power traverse for all table movements. A cherrying attachment may be applied to the cutter head, driven through gearing to the nose of the cutter spindle. Table, 22 x 48 in. Longitudinal feed, 48 in. Crossfeed, 17 in. Vertical feed, 15 in. Vertical feed of cutter head, 12 in. Spindle speeds, twelve from 27 to 790 r.p.m. Floor space, 10 x 10 ft. Height, 9 ft. Weight, 15,000 lb.

Drilling Machine, Multiple, Rail-Type, No. 19
Edwin Harrington, Son & Co., Philadelphia, Pa.
"American Machinist," Jan. 5, 1922



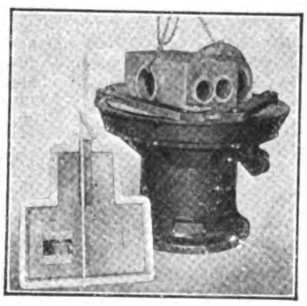
The chief feature of the machine is the in-and-out movement provided for each spindle for drilling irregular patterns. Four spindles are ordinarily furnished. The driving pulleys transmit 25 hp. By a clutch on the driving gear, any spindle may be stopped independently of the others. The feed may be operated universally for all spindles from the right-hand end of the machine, or separately for each spindle at the end of each arm. A handwheel on each head moves the spindles independently and sets them at the proper height when universal feed is used. Automatic stops disengage each spindle at any predetermined point. Floor space without a table, 17 ft. 10 in. x 7 ft. Height, 10 ft. 2 in. Weight with belt drive, 14,850 lb.

Drilling Machine, Vertical, 32-In.
Prentice Conradson, Green Bay, Wis.
"American Machinist," Jan. 5, 1922



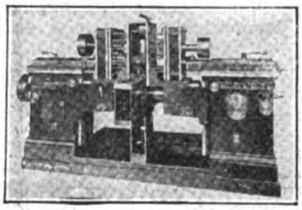
The machine has a swing of 32 in., but can be built in 25- and 36-in. sizes. The headstock, column and base are cast in one piece. Rectangular and sliding tables can be supplied. The driving motor is so mounted as to eliminate all moving parts possible. There are nine spindle speeds ranging from 34 to 500 r.p.m. Six feeds are provided ranging from 0.006 to 0.035 in per spindle revolution. Hand traverse, hand feed, stop and depth gage are provided. A no-load protection is also included. A 3-hp. motor running at 1,200 r.p.m. is used, but for extra heavy work a 5-hp. motor running at 1,800 r.p.m. can be employed. Floor space, 30 x 54 in. Height, 11 ft. 8 in. Weight, 3,700 lb. Export box, 135 cu.ft.

Grinding Machine, Disk, Vertical Spindle
Badger Tool Co., Beloit, Wis.
"American Machinist," Jan. 5, 1922



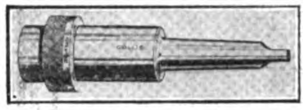
The steel disk wheel is 42 in. in diameter and is faced with a layer of abrasive material ⅜ in. thick molded on it. Direct drive is secured by using the motor shaft as the wheel spindle. The end yokes are dust proof and rigid. Positive forced-feed lubrication is supplied to both the radial and thrust ball bearings. A circular dust channel surrounds the wheel periphery and terminates in two openings to which the dust exhaust system is attached. The open construction makes it possible for more than one operator to work at the machine at a time. A 20-hp. motor running at 600 r.p.m. is used. Stop bars prevent the work from rotating with the wheel. Weight, 3,800 lb.

Drilling Machine, Automatic
Sellew Machine Tool Co., Pawtucket, R. I.
"American Machinist," Jan. 5, 1922



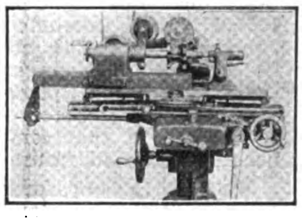
The machine is for production work on parts requiring multiple drilling on opposite sides. Work is changed in one arm of the work holder at the front of the machine while the work between the heads is being drilled. Both heads move forward simultaneously. The drills run at speeds proportionate to their diameters, each kind of work requiring different heads. The drill is slowed at its entrance into the work and when it breaks through. The heads have a quick return. Length 10 ft.; weight 5,000 lb.

Chuck, Quick-Change, "Wonder"
Collis Co., Clinton, Iowa
"American Machinist," Jan. 5, 1922



The chuck is adapted to use on drilling machines, lathes, screw machines, and other machines with revolving spindles, and allows rapid change of tools without stopping the spindle rotation. The collets have taper shanks and can be inserted without touching the chuck. Collets for holding different tools, such as taper-shank and straight-shank drills and hand taps, can be furnished. A special collet is provided for drills with twisted tangs or broken shanks. The chucks are made in six sizes, with standard taper shanks from Nos. 1 to 6, and outside diameters from 1⁹⁄₁₆ to 5¼ in. Collets are also made in a range of sizes to fit the chucks, and to hold drills and tools of different sizes.

Grinding Attachment, P. & W. Curvex Cutter
R. K. Le Blond Machine Tool Co., Cincinnati, Ohio
"American Machinist," Jan. 5, 1922



The maximum travel of the attachment is 8⅞ in. The cutters can be ground in diameters up to 5⅛ in. and lengths up to 7⅛ in. Since the flutes of the Curvex cutters are helical, the attachment is arranged to grind leads of from 9⁹⁄₁₆ to 172 in. per revolution. As the table of the grinder is fed horizontally, the cutter spindle is automatically revolved in proper relation to the lead and helical angle. The cutter is indexed by the plunger and index plate at the left of the arbor. The work is fed vertically to the wheel to the entire depth of the tooth. The grinding plane is always on a true radial line of the cutter, and the wheel clears itself in the work. Weight: for hobs only, 90 lb.; complete attachment, 110 lb.

Press, Hydraulic, Automobile Body
Southwark Foundry and Machine Co., Philadelphia, Pa.
"American Machinist," Jan. 5, 1922

The press has a capacity of 450 tons. One clamping platen and one stripper platen are provided. The stripper platen carries four hydraulic cylinders acting upon a forged steel plate, which in turn carries sixty stripper pins 1⅛ in. in diameter. The adjustable top platen carries eight hydraulic jacks used for clamping, each having a 5-in. ram and 5-in. stroke. The press is controlled by a single lever-operated valve. The automatically controlled clamping cylinders are capable of standing an hydraulic pressure of 5,000 lb. per square inch. Die space, 7 x 5 ft. Vertical opening between the platens: minimum, 18 in.; maximum, 4 ft.

Clip, paste on 3 x 5-in. cards and file as desired

Personals

William B. Given, Jr., vice-president of the American Brake Shoe and Foundry Co., has accepted the chairmanship of a committee co-operating with the Salvation Army in its appeal for $500,000 to carry on welfare work in the machinery industry in Greater New York.

C. J. **Houck** has been appointed foundry superintendent of the Hess-Snyder Co., Massillon, Ohio. He was formerly connected with the malleable plant of the Timken Detroit Axle Co., Canton, and previous to that time was with the Vulcan Iron Works, at Denver, Col.

H. E. **Harvey**, for the past five years assistant works manager for the Remington Arms Co., Bridgeport, Conn., has become superintendent of the Elyria Iron and Steel Co., Elyria, Ohio.

William Ochase, formerly sales representative of Manning, Maxwell & Moore, Inc., at Chicago, has been made efficiency engineer of the Ohio Machine Tool Co., at Kenton, Ohio.

J. R. **Dangler**, formerly assistant to the president of the Central Steel Co., Massillon, Ohio, has been appointed secretary and treasurer of the Vacuumeter Manufacturing Corporation, Cleveland, Ohio.

Fred Heiser has been appointed foundry superintendent of the malleable department of the Superior Steel Castings Co., Benton Harbor, Mich. He was formerly in charge of the malleable foundry of the Timken Detroit Axle Co., Canton, Ohio.

Louie S. Jones, one of the best known men in the machinery field, has resigned as general sales manager of the Lumen Bearing Company, of Buffalo, N. Y., to take effect July 1. Mr. Jones will retain his stock interest in the Buffalo and Youngstown plants of the Lumen Bearing Company and will also remain a director of the Youngstown plant of that company. He has not decided on his future plans.

William L. Colt, for five years manager of Willys-Overland, Inc., in the Eastern district, with headquarters at New York, has resigned to become the president and active head of the Overland-Providence Co., Willys-Overland distributors for Rhode Island, which concern he established and financed about a year ago. Carl P. Spiegelberg, who organized the Overland-Providence Co., under the supervision of Mr. Colt, will continue to operate the business as vice-president and general manager.

George M. Bassett, of the firm of Johnson & Bassett, manufacturers of wool spinning machinery, Worcester, Mass., has been elected president of the Worcester Mechanics Savings Bank, that city, succeeding John H. Coes, deceased.

Edmund C. Mayo, president of the American Tube and Stamping Co., Bridgeport, Conn., has been appointed a trustee of the large Municipal Garage building, Bridgeport, by Mayor Fred Atwater.

William R. Webster, vice-president of the Bridgeport Brass Co., Bridgeport, Conn., was elected a director of the American Tube and Stamping Co. at the recent annual meeting of the company.

James C. Potter, president of the Potter & Johnson Machine Co., machine tool manufacturers, Pawtucket, R. I., was chosen a director of the Slater Trust Co. at the recent annual meeting of that organization.

Frederick J. Kingsbury, president of the Automatic Machine Co., Bridgeport, Conn., has been elected a director of the American Tube and Stamping Co.

Business Items

The Ready Tool Co., of Bridgeport, Conn., has discontinued its representation through the Mayhew Steel Products Co., and in the future will handle its sales through the Bridgeport office.

The Meldrum-Gabrielson Corporation has opened its new factory at West Fayette and Niagara Sts., Syracuse, N. Y. This addition will be used for the manufacture of milling machine, gages, wood and metal patterns and small tools.

The J. M. Purves Tool Co. has been incorporated at Syracuse, N. Y., to manufacture and sell machine tools and appliances. The concern is capitalized at $150,000. Directors are J. M. Purves, W. A. Meyers, F. E. Friedman and J. A. Purves.

The James N. Kemp Machine Works, of Albany, N. Y., has been incorporated with a capital stock of $250,000. Directors are J. N. Kemp, M. L. Kemp, and W. C. Marron, all of Albany.

The Simmons Machine Co., Albany, N. Y., has opened a machinery warehouse at 182 Lafayette St., New York City. Machine tools which have been rebuilt at the Albany plant will be stored in this warehouse.

The Detroit office of the Taft-Pierce Manufacturing Co. has been moved from the Majestic Bldg., to 2230 First National Bank Bldg.

The Max Ams Machine Co. has opened new offices at 705 Commerce Bldg., Rochester, N. Y. H. S. Freeman is in charge.

At a meeting of directors of the Burr Company, machinery builders, of Champaign, Ill., the following officers were elected: Alvin Huckins, president; Marford Savage, vice-president; N. G. Burr, treasurer; W. S. Redhed, secretary.

The National Scale Co., Chicopee, Mass., recently filed papers of incorporation under the laws of Massachusetts to manufacture scales. The capital stock is $70,000, and the officers are: Frank D. Howard, president; Charles H. Leonard, 41 Arlington St., Chicopee Falls, treasurer; and Lewis I. Howard.

The Penn Seaboard Steel Co. has acquired the Titusville Forge Co. and the Rockaway Rolling Mills.

The Chicago branch of the Driver-Harris Company, of Harrison, N. J., has been moved to larger quarters at 562 West Randolph Street.

Trade Catalogs

"Union" Tooth Cutters. Union Twist Drill Co., Athol, Mass. A twelve-page catalog describing the high power undercut tooth cutters with the latest developments and improvements. The illustrations show a variety of cutters for use on high power milling machines. Space is devoted to side and face mills, helical cutters and twist drills.

Control Handbook: The Electric Power Club, 1017 Olive St., St. Louis, Mo. A thirty-page booklet containing simple descriptions of controllers for electric motors and definitions of the terms used in that connection. It is an excellent aid to those using electrical control apparatus as it gives information which all those engaged in that industry should know. The handbook is sold for twenty-five cents and can be obtained from the Secretary of the Club, S. N. Clarkson.

Brown Pyrometers. The Brown Instrument Co., Philadelphia, Pa. A circular describing some installations of Brown pyrometer controls in steel mills.

Brass Rod. Bridgeport Brass Company, Bridgeport, Conn. A circular describing the all Ledrite brass rod, chamfered on both ends.

Low-pressure Gas Inspirators. The Surface Combustion Co., New York City, N. Y. Catalog No. 3-D describing and illustrating, with complete specifications, a line of low-pressure gas inspirators, claimed to be applicable to any make of gas furnace.

Evaporator Systems. The Griscom-Russell Co., New York City, N. Y. Bulletin No. 360 describing the G-R evaporator systems for the economical production of distilled boiler feed water.

Forthcoming Meetings

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

American Welding Society: Annual meeting, Engineering Societies Building, New York City, April 26 to 29.

National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York City, May 8, 9 and 10. Secretary, George Boudinot, 50 Church St., New York.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

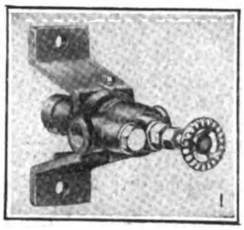
American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

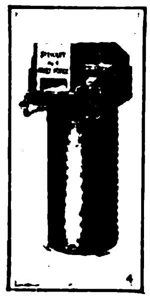
Burners, Gas, Furnace, Industrial
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The high-pressure burner illustrated is operated by air at a pressure of 10 lb. per square inch or over, or by dry steam at a pressure of 25 lb. per square inch. A combination high- and low-pressure burner is furnished for operation with compressed air at the same pressures and with blast air at from 4 to 6 oz. pressure. Only sufficient compressed air to atomize the oil is used, while the remaining air for combustion is supplied by a fan at low pressure. An intermediate pressure burner is also furnished for operation with air at from 1½ to 2 lb. pressure per square inch, supplied from a positive-pressure blower.



Forge, Rivet, Oil, Portable, Stewart, No. 6
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The forge is for use on either machine or hand work, burns oil, and employs compressed air for atomization. The oil is forced to the burner and atomized by the compressed air from the shop line, reduced to 20 lb. per square inch pressure by a regulating valve. An asbestos flame shield and blast pipe protect the operator. If desired, the forge may be mounted on a truck. Chamber of furnace: 12 in. wide, 12 in. deep; opening, 3 in. high, 7 in. wide. Height from floor to top of sill, 40 in. Oil capacity, 30 gallons.

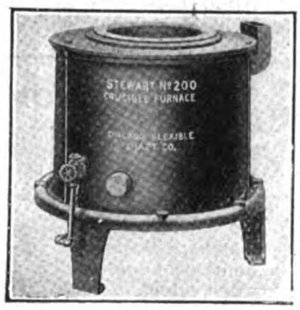


Furnace, Tempering, Oil, Stewart
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

This oil-fired furnace is intended for tempering dies, tools, punches and knives. The oil bath is headted slowly to a temperature of not more than 700 deg. F., and then is allowed to cool down rapidly to permit the addition of a new charge. The furnace is made in five sizes. Gas can be used as fuel. The weight varies from 355 to 1,550 pounds.

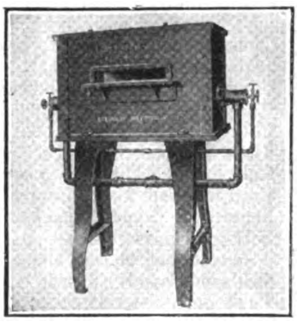
Furnace, Crucible, Stewart, No. 200
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

This crucible furnace is for use in lead or cyanide hardening, soft-metal melting, tinning and galvanizing. It is stated that the position of the burner gives the flame a rotary motion that results in a uniform distribution of heat around the pot. The pressed-steel pot is 14 in. in diameter and 14 in. deep. A No. 5 blower is required. Either gas or oil may be used as fuel. Floor space, 36 x 36 in. Weight, 1,300 pounds.



Forge, Gas or Oil, Stewart, No. 1
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The forge is used in welding and in miscellaneous forging work, as well as for heating rods and bolts prior to upsetting. Combustion occurs both beneath and at the sides of the opening, the flame striking the work directly. It is said that high heats are obtainable with economy of fuel, either gas or oil being employed. Opening, 12 x 2 in. Inside depth, 8 in. Floor space, 32 x 24 in. Weight, 800 pounds.

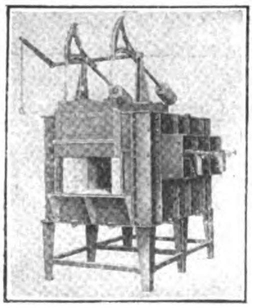


Furnace, Gas, High-Speed Steel, Double-Deck
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The upper chamber of the furnace is used for preheating, and is heated by the waste gases from the lower chamber. The lower chamber is fitted with carbofrax slabs to withstand the high temperature. Combustion takes place under the floor. Linings are 4½ in. thick, with special insulation 1 in. thick. The furnace is made in five sizes, with openings varying from 5 x 9 to 6 x 12 in. Floor space: smallest size, 28 x 30 in.; largest size, 36 x 40 inches.

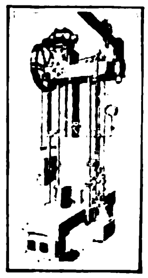
Forge, Hammer, Large, Stewart
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The furnace handles large forging work and is equipped with large burners to give high welding heat, and with provision for running off the slag at the rear. Doors may be provided at each end. Either oil or gas may be burned. The furnace is made in a range of sizes, and the smaller ones are mounted on legs. The larger sizes are of the iron-plate and fire-brick type, and are built on brick foundations. This form of furnace is adaptable to heating forging and welding work for steam hammers. Chamber: smallest size, 27 in. wide, 36 in. deep; largest size, double-door type, 99 in. wide and 63 in. deep. Sill height, 27 in.



Press, Hydraulic, Forcing, Reversed Cylinder
Watson-Stillman Co., 50 Church St., New York, N. Y.
"American Machinist," January 12, 1922

The machine is intended especially for pressing in and out locomotive driving-box brasses or pressing on and off gear or disks in railroad and other machine shops. A power-driven pump applies the pressure and a handwheel controls the motion of the ram. A jib is furnished with a trolley for attaching a chain hoist. Drive may be by belt or by direct-connected constant-speed motor. A gage indicates pressure on the ram in pounds per square inch, and also the total pressure in tons. The pump used is of the two-plunger type, and the entire control of the press is through a single valve. Capacity, 75 tons. Ram movement, 21 in. Bottom platen, 72 in. long.



Clip, paste on 3 x 5-in. cards and file as desired

The Weekly Price Guide

THIS WEEK'S MARKET

Advances—Steel shapes, plates and mild steel bars quoted at $1.60 per 100 lb., Pittsburgh. Orders where specifications are especially attractive to makers and buyers are not particular as to deliveries, represent the only quotations remaining at $1.50. Advancing fuel costs causing firmness in pig iron at Pittsburgh; demand for basic iron keen in Youngstown and price advance anticipated in Birmingham. Bolts and nuts advanced 10 per cent at Pittsburgh mill; steel sheets firmer.

Tin quoted at 32⅛c. as against 31c.; lead, 5⅝c. advanced from 5½c. and antimony 5½c. as compared with 5¼c. per lb. in New York warehouses. Cleveland quotes antimony at 6¾c. as against 6½c. per lb.

Raw linseed oil at 89c. in New York as compared with 84c. per gal. (5 bbl. lots) one week ago.

No Declines—Copper quiet; zinc showing better demand with prices unchanged.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21.00
Northern Basic	21.02
Southern Ohio No. 2	21.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.87
BIRMINGHAM	
No. 2 Foundry	16.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22.26
Virginia No. 2	28.74
Basic	20.25
Grey Forge	21.00
CHICAGO	
No. 2 Foundry local	20.70
No. 2 Foundry, Southern, sil 2.25@2.75	22.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.46
Basic	20.46
Bessemer	21.46

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	10.0	6.0	4.0
Philadelphia	8.0	5.0	2.65
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Denver	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.40	3.28	3.10	3.38
No. 12	2.45	3.33	3.15	3.43
No. 14	2.50	3.38	3.20	3.48
No. 16	2.70	3.48	3.30	3.58
Black				
Nos. 17 and 21.	3.00	4.05	3.55	4.10
Nos. 22 and 24.	3.05	4.10	3.60	4.15
Nos. 25 and 26.	3.10	4.15	3.65	4.20
No. 28	3.15	4.25	3.75	4.30
Galvanized steel sheets:				
Nos. 10 and 11.	3.15	4.25	3.75	4.30
Nos. 12 and 14.	3.25	4.35	3.85	4.40
Nos. 17 and 21.	3.55	4.65	4.15	4.70
Nos. 22 and 24.	3.70	4.80	4.30	4.85
No. 26	3.85	4.95	4.55	5.00
No. 28	4.15	5.25	4.75	5.30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.56	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.60	4.56	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2.48	2.31	2.38
Soft steel bars (base)	2.38	2.21	2.28
Soft steel bar shapes (base)	2.38	2.21	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.48	2.31	2.38
Bar iron (2.00@2.10 at mill)	2.38	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
$\frac{3}{32}$	8.00		12@13
$\frac{1}{8}$	6.50		11@12
$\frac{5}{32}$ to $\frac{1}{4}$	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.62½
Tin, 5-ton lots, New York	32.12½
Lead (up to carlots), St. Louis, 5.27½; New York	5.62½
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.75	6.25
Copper sheets, base	19.50@20.50	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.25	16.00	15.75
Brass wire (carlots)	16.75	17.75	.....
Zinc sheets (casks), (8% dis. carlots)	9.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....
Solder (½ and ½), (caselots)	18.00	22.00	19.00
Babbitt metal (best grade)	30.80	39.50	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	9.50	9.25
Copper, light, and bottoms	8.50	8.50	8.25
Lead, heavy	3.75	3.75	3.65
Lead, tea	2.75	2.75	3.00
Brass, heavy	5.75	5.50	8.00
Brass, light	4.25	4.00	4.75
No. 1 yellow brass turnings	5.00	5.50	5.00
Zinc	2.75	2.25	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
Terne Plat				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb.	.055@.09	.09	.09
Wiping cloths per M., 13¼x13¾	....	50.00	55.00
Wiping cloths per M., 13¾x20½	....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.89	.95	.90
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville...per net ton		$3.25@$3.50	
Coke, prompt foundry, Connellsville...per net ton		$4.25@$4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60-5%	60-10%	60%
1⅛ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	....	65-5%
Lag screws, coach screws	65%	....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	....	55%
Tap bolts, hex. heads	25%	....	.....
Semi-finished nuts ⅝ and larger	75%	75-10%	80%
Case-hardened nuts	65%	....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	60-10%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.35	$3.25	$3.00
Cone heads, ditto (net)	3.45	3.35	3.10
1¼ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	....	0.15
⅝ in. diameter *EXTRA*	0.15	....	0.15
½ in. diameter *EXTRA*	0.50	....	0.50
1 in. long, and shorter *EXTRA*	0.50	....	0.50
Longer than 5 in. *EXTRA*	0.25	....	0.25
Less than 200 lb. *EXTRA*	0.50	....	0.50
Countersunk heads *EXTRA*	0.35	......	$3.35 base
Copper rivets	60-5%	50%	50-10%
Copper burs	40%	50%	.....

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50-5%	60-10%
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	35%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Ala., Mobile—The Alabama Drydock Co., Foot of Eslava St., is not in the market for two 27 in. LeBlond lathes and one No. 4 LeBlond milling machine as published in our issue of March 23.

Conn., Stratford—J. G. Robson—No. 3 Bardons and Oliver screw machine, (used), also No. 2, No. 3 and No. 4 forging machines.

Ill., Chicago—The Atchison, Topeka & Santa Fe R.R., 80 East Jackson Blvd., M. J. Collins, Purch. Agt.—one 4 spindle combined turning end threading machine; one angle iron bending roll 4 in. x 4 in. x ½ in.; one splitting shear, heavy duty type up to 1¼ in.; one gate shear 10 ft. long, 20 in. throat ¾ in. capacity; one 6 ft. radial drill; one 72 in. squaring shear ½ in. capacity; two 24 in. drills Barnes, all geared; one hot saw heavy duty type power feed for cutting locomotive T bars.

Ill., Chicago—A. Hess, 1219 South Western Ave.—one No. 20 punch press weight about 3,000 lb. also one small three spindle Fox drill and one small power square shears.

Ill., Chicago—The International Harvester Co., 606 South Michigan Ave., Purch. Dept. Erie steam hammer, 4,000 lb. (used).

Ill., Chicago—The Printing Mchy. Co., 505 Fisher Bldg., Van Buren and Dearborn Sts., H. T. Simpson, Purch. Agt.—duplex milling machine.

Ind., LaPorte—The L. A. Althoff Mfg. Co., Inc., of LaPorte has taken over assets and liabilities of the L. A. Althoff Co. of Illinois and will install few machine tools and other equipment.

Ind., Marion—The Allmur Mfg. Co., manufacturer electric cook stove, L. L. Kimmel, Purch. Agt.—No. 4 consolidated punch press or its equivalent.

Mass., Springfield—P. S. Stauffer & Son, 67 Governor St., manufacturer of sheet metal stamping equipment—20 in. back geared drill press.

Mich., Detroit—W. L. Howarth, 4323 Trumbull Ave.—No. 5 or No. 6 Toledo geared press or its equivalent.

Mich., Detroit—J. F. Lamb Co., 1938 Franklin St.—miscellaneous machine shop equipment including motors, ½ to ¾ hp., 110 volt, 60 cycle, single phase.

Mich., Halfway—C. F. Kaiser—complete equipment for repair shop, including blacksmith tools and equipment, drill press, etc., (used).

Mich., Northville—E. E. Perkins, Route 2—drill press; combination band, rib and cut-off saw, electric blower; one direct current, 7 hp. motor, also a complete set blacksmith's tools.

Mich., Wyandotte—The All-Metal Products Co., Labodie St.—ten Niagara presses Nos. 3, 4 and 5 also one Van Norman milling machine No. 2.

Minn., Minneapolis — The Armstrong Transfer & Storage Co., 320 7th St., S. E., F. H. Armstrong, Pres.—power machine tools for auto repair shop.

Minn., Minneapolis—O. M. Nelson, 65 Western Ave.—machine tools equipment for auto repair shop at 317 8th St. S.

Mo., Joplin—E. Cox & Son, 313 East 3rd St., E. Cox, Purch. Agt.—power lathe.

Mo., Joplin—The Jobson Auto Repair Co., 311 Virginia Ave., M. Jobson, Purch. Agt., —drill press and lathe for power.

Mo., Kansas City—The Jobson Furnace Co., J. J. Jobson, Purch. Agt.—tinners tools including square shears and notching press.

Mo., St. Louis—The Natl. Lead Co., 722 Chestnut St., W. M. Lowry, Purch. Agt.—punch press to punch ¾ in. diameter hole in ¾ in. plate or heavier; one forming roll to handle ½ in. plate, also 100 ft. steel head frame; one shear with 24 in. throat or longer to cut ½ in. plate; one 300-350 cu.ft. air compressor, 100 lb. pressure, motor or belt driven, A.C. direct connected preferred.

Neb., Lincoln—The Holland Furnace Co., 843 O St., D. Van Lente, Purch. Agt.—small sheet metal crimping machine.

Neb., Lincoln—The Ideal Auto Tinners (Sharton and Derrick), 918 N St., B. Derrick, Purch. Agt.—one 30 in. folder and one 40 in. square shear.

Neb., Sidney—J. Treinan—lathe about 18 in. x 10 ft. bed, (used).

N. J., Newark—Kreuter & Co., 571-585 18th Ave., manufacturers of mechanics tools, W. H. Hall, Purch. Agt.—No. 14 Gardner grinder complete with counter shaft, water pumps, etc.

N. Y., Adams Center—Williams Garage Co., Main St., C. Williams, Purch. Agt.—electric driven blower; forge parts and castings for built in forge; small high speed upright drill for electric drive (new or used).

N. Y., Binghamton—F. Sprout, Collier and State Sts.—complete equipment for automobile and engine repair.

N. Y., Buffalo—W. G. Day, 2120 Fillmore Ave.—machinery and equipment for radiator and auto repair station.

N. Y., Buffalo—H. R. Sontag, 1896 Niagara St.—equipment for automobile and machine repair shop.

N. Y., Buffalo—M. M. Swerdloff, 424 Prudential Bldg.—tools and equipment for repairing automobiles.

N. Y., Buffalo—R. E. Williams, 809 Iroquois Bldg., (contractor)—machinery for the manufacture of light metal and woodwork.

N. Y., Farnham—Ingraham & Pizzolanti—machinery and equipment for garage now in course of construction.

N. Y., Rochester—The North East Electric Co., 348 Whitney St., A. M. Anderson, Purch. Agt.—one 2 spindle No. ½ bench type Avey drill; one No. 2 Avey tool room drill; one No. ½ Avey single spindle column type drill; one 3 spindle No. ½ Avey column type drill and one 2 spindle No. 1 Avey drill.

N. Y., Utica—E. Steinhorst Co., Mohawk and Eagle Sts., E. Steinhorst, Purch. Agt.—power driven sheet metal working tools and equipment.

N. Y., Vernon—Uebler Mfg. Co., manufacturer milking machines, J. S. Ferris, Secy. and Treas.—power punch press.

N. Y., Watertown—The Gould & Gould Mfg. Co., 732 Cooper St., R. D. Gould, Purch. Agt.—small machine tools and special equipment for the manufacture of jewelry.

O., Cincinnati—The Jones Machine Tool Co., 435 East Pearl St., W. F. Jones, Purch. Agt.—one 42 in. x 18 ft. center lathe for stone cutting; No. 23 New Britain automatic; one 1½ in. bolt cutter; one open back inclinable stamping press plain or geared, weighing 2,500 to 7,000 lb. with stroke from 3 to 4 in.; one 48 in. x 20 ft. lathe; 48 in. x 16 ft. modern planer, motor driven, d.c. current, 220 volts.

O., Cincinnati—The Pollack Steel Co., Carthage Ave., G. J. Myers, Purch. Agt.—Massillon No. 5 trimming press, 16¾ in. die space, etc., or its equivalent.

O., Cleveland—The Central Brass Mfg. Co., 6203 Cedar Ave., manufacturer drinking fountains, faucets, valves, etc., L. S. Fisher, Purch. Agt.—No. 33 New Britain standard chucking machine.

O., Cleveland—The Economy Plumbing & Heating Co., 12302 St. Clair St.—wood turning or machine bench lathe about 9 in. swing and 3 ft. bed.

O., Cleveland—The K. W. Ignition Co., Chester and East 30th Sts., A. Barr, Purch. Agt.—one 50 ton power press with 4 in. stroke.

O., Cleveland—Parish & Bingham Co., Madison and West 106th Sts.—one No. 5½ consolidated press.

O., Columbus—E. H. Huffman & Sons, 243 South 4th St., E. H. Huffman, Pres.—general service station machinery including drill presses, small lathe and grinding machine.

Pa., Cherry Tree—The Cherry Tree Machine Co., J. L. Stiffler, Purch. Agt.—

One No. 62 Fellows gear shaper with standard change gears.

One horizontal boring mill with 3 ft. x 5 ft. table, 30 in. traverse of bar, etc.

One 20 in. engine lathe capable of taking 6 in. between centers.

One Hexagonal turret lathe.

One 2 head wheel turning lathe capable of swinging 36 in. and approximately 40 in. to 60 in. between centers.

One Centerless grinder for grinding axels, etc., to take shafts 1 in. to 4 in. diameter.

One drill grinder for drills up to 1½ in.

Two wheel grinders.

One 24 in. shaper.

One Universal milling machine.

One 4 ft. to 5 ft. Universal or semi Universal radial drill.

One 2 or 3 spindle sensitive drill press capable of driving ¾ in. diameter drills.

One 200 ton capacity hydraulic wheel press.

Pa., Erie—H. C. Cowley, 1139 East 28th St.—one 14 in. or 16 in. lathe and small grinder.

Pa., Phila.—The Art Furniture Mfg. Co., 835 Race St.—one 16 in. swing wood turning lathe.

Pa., Phila.—B. Luberman, 20th St. and Allegheny Ave.—equipment for machine shop.

Pa., Phila.—The Ritter Can & Specialty Co., 1026 Sedgeley Ave.—equipment for the manufacture of metal working machinery, including shears (Bench & Circle), furnaces, brakes, etc.

Pa., Rockview (Lemont P. O.)—The Western Pennsylvania Penitentiary—lathe, floor grinder, drill press, pipe machine, and a 48 in. power grindstone.

Pa., Troy—The Bailey & Powers Co.—complete machine tool equipment for gas engine repair.

Va., Richmond—Anderson & McMullen, 2047 West Broad St.—small lathe and a drill press for auto repair shop.

Va., Richmond—The Anderson Motor & Sales Corp., 1815 West Broad St.—lathe, drill press buffing machine and bench tools for auto repair work.

Va., Richmond—F. L. Benton, 1649 West Broad St.—lathe, drill press, buffing machine and bench tools for auto repair work.

Va., Richmond—The Bitner Motor Corp., 301 North Gilmore St.—cylinder grinding machine and small lathe.

Va., Richmond—C. E. Booth, Jr., 916 West Broad St.—lathes, drill press and bench tools for auto repair work.

Va., Richmond—A. I. Fleming, 1623 West Broad St.—lathes and a drill press, (used).

Va., Richmond—Fulton & Barnes, 1643 West Broad St.—cylinder grinder.

Va., Richmond—Gann, Barlow & Crow, 335 Mumford St., A. Gann, Purch. Agt.—drill press and lathe.

Va., Richmond—The Owens Motor Co., 2100 West Broad St.—lathe, drill press, buffing machine and bench tools for auto repair work.

Va., Richmond—J. K. Bohannon, 722 West Broad St.—drill press.

Va., Richmond—Shinaults Bicycle Shop, 506 West Broad St.—small lathe and buffing machine.

Va., Richmond—Stuart-Warner Service Co., 1615 West Broad St.—power grinder, bench drill.

W. Va., Charleston—The State Rd. Comn.—one power shear 96 in. blade; power punch press 40 ton capacity; one air compressor.

W. Va., Wheeling—The Dillon Bros. Machine Co., 8 South Huron St.—forging hammers and other tools for new shop at Bridgeport, O.

Wis., Appleton—The Gibson Auto Exchange Co., College Ave.—auto repair shop equipment for proposed garage and repair shop on College Ave.

Wis., Beaver Dam—H. Brueckner—auto repair equipment and machinery for proposed garage and repair shop on Main St.

Wis., Beloit—J. Terwillizer, 318 Broad St—equipment for auto repair shop including air compressor, 1 ton press, etc.

Wis., Cudahy—F. Barnhardt, 919 Packard Ave.—sheet metal working machinery.

Wis., Kenosha—The Krisor Bros., 772 Milwaukee Ave.—air compressor, gas storage tank and pump and bench tools for proposed garage on Milwaukee Ave.

Wis., Milwaukee—The Bd. Educ., 10th and Prairie Sts.—one 14 in. x 6 ft. Hamilton tool room lathe; No. 3 Arbor press; No. 2 Brown & Sharpe surface grinder; six 11 in. x 4 ft. and six 13 in. x 5 ft. engine lathes, also various other equipment.

Wis., Milwaukee—E. Meister, 501 Harmon St. (garage)—repair shop equipment including drill press.

Wis., Sturgeon Bay—The Sturgeon Bay Garage, M. Peterson, Purch. Agt.—drill press, air compressor, lathe, gas storage tank with pump jacks.

Ont., Ridgetown—H. E. Cavell—equipment for small general repair shop at Listowel, including lathe, planer, shaper and drill press.

Ont., Walkerville—The Gotfredson-Joyce Corp., Ltd.—machinery for proposed garage on Spadina Ave., Toronto.

Machinery Wanted

Conn., Shelton—Sidney Blumenthal & Co., Inc., manufacturer of pile fabrics, O. J. Bell, Purch. Agt.—Davis & Furber 82 in. brass plate warp reels with single beamers complete.

Fla., Tampa—The City, A. W. D. Hall, Mgr.—freight handling machinery, electric trucks, etc. for modern ship terminals.

Fla., West Palm Beach—The Palm Beach Creamery Co., A. F. Neilson, Pres. —dairy and ice cream manufacturing equipment.

Ia., Ft. Dodge—The Fort Dodge Culvert & Steel Co., manufacturer of bars, shapes, culvert pipe, etc., R. M. Stevens, Secy.-Treas.—roughing mill 18, 20 or 22 in. of one, two or three stands with usual equipment, also steam engine to operate above mill and a present 10 in. mill besides.

Ill., Chicago—The Chicago Pump Co., 2336 Wolfram St.—planer-type milling machine with adjustable rail having two vertical heads and one or two horizontal heads with table 36 in. wide and 10 ft. or longer, Ingersoll or Newton make preferred.

Ill., East Peoria—(Peoria P. O.)—The Crown Fdry. Co.—complete equipment for the manufacture of gray iron, chilled and semi-steel castings.

Ill., Rochelle—The Caron Spinning Co., Inc., manufacturer of yarns—one single apron wool dryer similar to Sargents, capacity 2,000-3,000 lb. daily.

Ind., Alexandria—The Ziegler Mfg. Co., metal stampings and screw machine products, L. A. Ziegler, Purch. Agt.—rotary annealing furnace, similar to the Rockwell 153.

Mich., Detroit—The Adams Lithograph Co., 307 West Congress St.—lithographing machinery and equipment.

Mich., Detroit—P. Kirschbaum & Son, 3776 Woodward Ave.—Eastman cloth cutting machine with straight blade.

Mich., Detroit—The Peninsular Paper Can Co., 1725 Hastings St.—stencil cutting machines.

Mich., Detroit—J. B. Warren, 337 Bagley Ave., printers and printers supplies—14 x 22 in. job press.

Mich., Highland Park (Detroit P. O.)—S. J. Howe, 200 McLean Ave.—complete equipment for the manufacture of paint.

Mo., Joplin—G. B. Bartlett, 1204 Illinois St. (printer)—10 x 15 printing press.

Mo., Joplin—The Joplin Store Fixture Exchange, 713 Bway., R. Gilstrah, Purch. Agt.—power buffing and polishing machinery.

Mo., Joplin—A. E. Maitland, 301 Virginia Ave.—mining machinery and belting.

Mo., Joplin—The Williams Sash & Door Wks., 514 North Main St., J. P. Williams, Purch. Agt.—dove tail machine for making boxes.

Neb., Lincoln—The Lincoln Traction Co., Terminal Bldg., A. G. McMaster, Purch. Agt.—air compressor, 50 cu.ft., (used).

N. J., Newark—The Newark Billiard Table Co., 478 Market St.—leather splitting machine about 18 in. cutter.

N. Y., Bath—The Bath Roller Mills, J. Faucett, Prop.—machinery and equipment for roller mill.

N. Y., Binghamton—The Binghamton Glass Wks., 28 Crandell St.—glass furnace to replace one recently destroyed by explosion.

N. Y., Buffalo—The Bd. Educ., D. J. Sweeney, Secy.—receive bids until April 30, for furnishing the manual training departments with brads, screws and small supplies for year ending Apr. 30, 1923.

N. Y., Buffalo—The Buffalo City Hospital, 462 Grider St., G. S. Staniland, Secy. —receive bids until May 8 for refrigeration and ice making machinery.

N. Y., Buffalo—The Interstate Paint & Supplies Co., Inc., address M. A. Harrington—machinery, tools and equipment for use in manufacture of chemicals and paints.

N. Y., Buffalo—D. Kern, 83 Roesch St.—bakeshop equipment.

N. Y., Buffalo—The Queen City Plating Wks., 103 Sycamore St.—machinery for proposed plating and buffing factory at 566 Michigan Ave.

N. Y., Buffalo—J. Schaaf, Miller Ave. and West Shore R.R.—machinery for proposed shoe factory on Northampton St.

N. Y., Buffalo—Walton & Hoffman, 648 Ellicott St.—machinery for peeling, slicing, sacking and canning potatoes for potatoe chips. Proposed factory at 85 Demond Pl.

N. Y., Gouverneur—The Gouverneur Marble Quarries, J. H. O'Brien, Purch. Agt. —hoisting machinery and marble sawing equipment.

N. Y., Naples—The New York Pea Packers Inc., J. F. Connor, Mount Morris, Purch. Agt.—special machinery and equipment for canning fresh vegetables and fruits. (For several plants.)

N. Y., Olean—W. F. Foss & Son—machinery and equipment for bakery.

N. Y., Syracuse—The Syracuse Boys Club, 436 East Jefferson St., F. K. Zerbee, Secy.—$1,000 worth of woodworking machinery, including a band saw and planer.

N. Y., Watertown—D. C. Hunt Co., 534 Mill St.—bread and pastry mixing and baking machinery and equipment, complete outfit.

N. Y., Watertown—Smith Bros. Constr. Co., Cleveland Bldg., S. D. Smith, Purch. Agt. —complete outfit and equipment for field blacksmith shop.

O., Cincinnati—The W. T. Johnston Co., 3rd and Vine Sts., J. M. Howard, Purch. Agt.—one 7 in. x 10 in. D. D. D. C. hoisting engine; one 8 in. x 10 in. double drum, double cylinder hoisting engine and a jaw stone crusher.

O., Cleveland—F. J. Albany, Sweeney Ave. and East 55th St.—machinery and equipment for the manufacture of concrete laundry tubs.

O., Cleveland—The Fanner Mfg. Co., Brookside Park, J. E. O'Brien, Purch. Agt. —one 661 Toledo embossing press for foundry.

O., Cleveland—The Sanitary Wet Wash Laundry Co., East 93rd St.—laundry machinery and equipment.

Okla., Picher—The Fischer Harness Co., 400 Connell Ave., L. C. Fischer, Purch. Agt. leather working machinery.

Pa., Butler—The Standard Steel Car Co. —one 3-ton hand power crane for foreign shipment.

Pa., Clifton Heights—The Kent Mfg. Co., manufacturer of yarns—carders, twisters, dryers, etc.

Pa., Erie—The Erie Metal Furniture Co., Inc., E. Bauschard, Secy.—machinery for proposed metal furniture plant.

Pa., Girardville—C. H. Hein—knitting machinery for new addition to mill.

Pa., Phila.—The Berkley Knitting Co., 1326 Vine St.—machines of various styles: knitting machines and Rachel machines will also use electric power.

Pa., Phila.—Bla-Shone Hosiery Corp., Allegheny Ave. and Hancock St., M. Schoneman, Purch. Agt.—automatic hosiery machines and finishing machines.

Pa., Phila.—City Dept. of Highways, City Hall, F. C. Dunlap, Chief—Shone-Duplex ejector system for sewerage, 2 units, capacity 200 gal. per minute, to be installed complete.

Pa., Phila.—G. S. Cox & Bros., Inc., Cambria and Ormes St., haircloth manufacturers—revolving flat cords, drawing frames, improved twisters, etc., for new building.

Pa., Phila.—The Darlney Bros., Chester Ave. and Boynton St.—spinning machines, looms, carders, belting, shafters, etc., also machinery for repair shop.

Pa., Phila.—Dept. Pub. Wks., City Hall, F. Caven, Dir.—2 horizontal crank and flywheel double acting air compressors, 12 in. diameter cylinders, 10 in. stroke, 250 lb. per minute.

Pa., Phila.—T. Develin, Jr., Lehigh Ave. and Hancock St.—addition machinery for new carpet mills.

Pa., Phila.—G. Esslinger & Sons, 10th and Callowhill Sts.—conveyors and additional bottling machinery for brewery.

Pa., Phila.—R. Hirsh & Sons, 2720 North Hope St., S. Hirsh, Purch. Agt.—additional machinery for the manufacture of upholstering fabrics.

Pa., Phila.—Penn Screw Machine Wks., 712 Cherry St.—colletts and feeding fingers for No. O, B and S automatics.

Pa., Phila.—The Peerless Paper Box Mfg. Co., 1432 North Randolph St.—folders, cutters, saws, etc., also printing presses for new addition.

Pa., Phila.—The Roosevelt Worsted Co., 20th and Naudain St.—carders, looms, dryers and spinning machines.

Pa., West Chester—Hoopes Bros. & Thompson—one electric air pump and compressor for garage.

Tenn., Jellico—The Diamond Hosiery Mills—300-320 needle ribbing machines, Wildman or equal.

Tenn., Knoxville—The Duncan Mchy. Co., Dempster Bldg., 721 North Central St.—well machines without power, (new or used), No. 5 Gates gyratory crusher, manganese lining, (used), saw mills, portable engines, etc.

Wis., Antigo—The Mattefs Bros. Co., G. Mattefs, Pres.—woodworking machinery including saws, etc., for proposed saw mill on Main St.

Wis., Appleton—The Northern Boiler Structural Iron Co., Mills St.—special equipment for boiler plant including several tubular boilers and two traveling cranes.

Wis., Chippewa Falls—The Enterprise Oil Co., 401 Bay St.—pumps and filling station equipment for garage at Eau Claire.

Wis., Fairwater—O. H. Riant—complete equipment for blacksmith shop and for repairing wagons, etc.

Wis., Holmen—The Holmen Creamery Assn., V. S. Keppel, Mgr.—modern equipment for proposed dairy.

Wis., LaCrosse—The Vocational School Bd., 60 Vine St., J. D. Coleman, Dir.—equipment for vocational school, incl. woodworking machinery, etc. Estimated cost, $2,000.

Wis., Lake Geneva—The Mann Candy Co., c/o F. Mann—refrigerating machinery for proposed ice cream factory.

Wis., Merrill—The Trantow Bros. Garage Co., c/o A. Trantow—equipment for auto repair shop including air compressor and a 1 ton press.

Wis., Milwaukee—A. J. Pietsch, 539 31st St.—additional woodworking machinery.

Wis., New London—Hamilton & Sons Canning Co.—special canning and power machinery.

Wis., Oshkosh—The Gibson Auto Co., 7 Church St.—auto repair equipment and small power unit machinery for garage and repair shop at Appleton.

Wis., Park Falls—The Flambeau Paper Co., G. Waldo, Mgr.—machinery and equipment for proposed paper mill.

Ont., Guelph—The Bd. Educ., H. J. Leadlay, Secy.—machinery, tools and equipment for general technical school work also physics and laboratory equipment.

Ont., Hamilton—The Kanadda Biscuit Co., Ltd., 185 West Ave. N.—motors and bakery equipment.

Ont., Staples—Hillman & Dalton—equipment for the manufacture of drain tile.

Ont., Wallaceburg—The Prestolock Co. of Canada, E. E. Theis, Mgr.—special machinery and equipment for the manufacture of radio equipment.

Metal Working Shops

Cal., Burlingame—H. C. Vielbaum, c/o J. W. F. Ryan, Engr., 1202 Bway., has awarded the contract for the construction of a 1 story garage on San Mateo Dr. near Howard Ave. Estimated cost, $40,000.

Cal., San Francisco—The Magnolia Metal Co., Pacific Bldg., has awarded the contract for the construction of a 1 story, 45 x 100 ft. metal plant on Bryant and Sterling Sts. Estimated cost, $10,000. Noted April 20.

Cal., San Francisco—The Wellman-Peck Co., 311 Embarcadero St., has awarded the contract for the construction of a 3 story addition to its garage and loft building on Embarcadero and Jackson Sts. Estimated cost, $40,000.

Conn., Wallingford—The International Silver Co., Meriden, has awarded the contract for the construction of a 1 and 2 story, 45 x 130 ft. and 30 x 30 ft. additions to its factory on Center St. here. Estimated cost, $30,000.

D. C., Langdon—The Fleischmann Co. has had plans prepared for altering and building an addition to its fermenter house here. Estimated cost, between $25,000 and $30,000. Milburn, Heister & Co., Union Savings Bank Bldg., Wash., D. C., Archts.

Ill., East Peoria—(Peoria, P. O.)—The Crown Fdry Co. recently incorporated, is building a plant for the manufacture of gray iron, chilled and semi-steel castings.

Ill., Paris—H. Link is having plans prepared for the construction of a 1 story, 66 x 140 ft. garage. Estimated cost, $40,000. Liese & Ludwick, 618 Temple Bldg., Danville, Archts.

Ill., Peoria—C. Welti, 518 Hamilton St., has awarded the contract for the construction of a 1 story, 70 x 120 ft. garage. Estimated cost, $40,000. Noted March 23.

Ill., Riverdale—The Riverdale Rolling Mill Co. has awarded the contract for the construction of a 1 story, 65 x 140 ft. rolling mill. Estimated cost, $25,000.

Mass., Medford—The Amer. Radio & Research Co. plans to build a 1 story, 60 x 120 ft. addition to its plant. Estimated cost between $30,000 and $35,000. Private plans.

Mass., Whitinsville—The Whitin Machine Wks., has awarded the contract for the construction of a 3 and 4 story factory; a 2 story garage and fire station and a gymnasium. Estimated cost, $500,000. Noted March 23.

Me., Augusta—The Waterville Motor Co., Waterville, is having plans prepared for the construction of a 2 story, 50 x 70 ft. service and repair station on Bangor St., here. Estimated cost, $40,000. H. T. Muzzy, 173 Main St., Waterville, Archt.

Minn., Minneapolis—C. F. Haglin & Sons, 226 Lumber Exchange Bldg., will build a 1 story, 132 x 165 ft. garage at 317 8th St., S. Estimated cost, $40,000. O. M. Nelson, 65 Western Ave., lessee.

Minn., Minneapolis—A. Hanson and M. C. Madsen, 848 Builders Exch. Bldg., have awarded the contract for the construction of a 2 story, 100 x 250 ft. garage and sales room at 2824-30 University Ave., S. E. Estimated cost, $65,000.

Mo., St. Louis—F. L. Cornwall, LaSalle Bldg., will build a 1 and 2 story, 130 x 137 ft. and 40 x 130 ft. service building on Sarah St. and Forest Blvd. Estimated cost, $75,000.

Neb., Havelock—Schmidt Bros. are having plans prepared for the construction of a 50 x 140 ft. garage. J. Tyler, 418 Richards Bldg., Lincoln, Archt.

N. Y., Binghamton—F. Sprout plans to build a 2 story repair shop and garage on Hawley, State and Collier Sts. Estimated cost, $40,000.

N. Y., Lowville—The G. A. Smith Co. plans to build a 1 story garage and machine shop on State and Jackson Sts. Estimated cost between $35,000 and $40,000.

N. Y., Watertown—The Watertown Garage Corp. plans to build a garage on State St. Estimated cost between $70,000 and $80,000. Address A. F. Lansing, Sherman Bldg.

O., Cincinnati—L. P. Hazen & associates, Court House, plan to build a 12 story garage on 100 x 140 site on 8th St. Estimated cost, $1,000,000. Architect not selected.

O., Cleveland—F. A. Maher, Wilton and Somerton Aves., has awarded the contract for the construction of a 1 story, 39 x 116 ft. garage at 2180 Lee Rd. Estimated cost, $40,000.

O., Cleveland—The Superior East 49th Co., c/o G. Paul, 611 Fidelity Mortgage Bldg., plans to build a 1 and 2 story garage and commercial building, on East 49th St. and Superior Ave. Estimated cost, $200,000. J. F. Steffens, 611 Fidelity Mortgage Bldg., Archts.

O., Dayton—The Bd. Educ. plans to build a 2 story, 60 x 300 ft. high school to include machine and wood working shops. Estimated cost, $1,500,000. Schenk & Williams, Mutual Home Bldg., Archts.

O., East Cleveland (Cleveland P. O.)—W. F. McCarty, 14840 Euclid Ave., has had plans prepared for the construction of a 1 story, 50 x 133 ft. garage and commercial building on Euclid Ave., here. Estimated cost, $40,000. Private plans.

O., Euclid—D. S. Blossom of the W. Bingham Co., West 9th St., Cleveland, has had plans prepared for the constructon of a 2 story, 48 x 76 ft. garage and stable on Richmond Rd., here. Estimated cost, $40,000. A. Garfield, Natl. City Bldg., Cleveland, Archt.

Pa., Butler—The Butler Buick Co. has awarded the contract for the construction of a 3 story, 83 x 110 ft. garage and sales room on Main St. Estimated cost, $150,000. Noted Feb. 23.

Pa., Phila.—E. Mervish, c/o J. E. Fieldstein, Archt., Otis Bldg., has awarded the contract for the construction of a 1½ story, 120 x 120 ft. garage on Frankford and Berk Sts.

Wis., Appleton—The Gibson Auto Co., 7 Church St., Oshkosh, is receiving bids for the construction of a 2 story, 40 x 100 ft. garage and repair shop on College St., here. Estimated cost, $40,000. C. R. Meyer & Sons Co., 52 State St., Oshkosh, Archts.

Wis., Appleton—The Northern Boiler Structural Iron Co., Mills St., is having plans prepared for the construction of a 1 story, 80 x 100 ft. boiler plant. Estimated cost, $70,000. E. Kottke, care of owner, Engr.

Wis., Beaver Dam—H. Brueckner is having plans prepared for the construction of a 1 story, 46 x 50 ft. garage on Main St. Estimated cost, $50,000. W. F. Bossman, Beaver Dam, Archt.

Wis., Beloit—J. Terwillizer, 318 Broad St., plans to build a 2 story, 73 x 120 ft. garage on Broad St. Estimated cost, $55,000. Architect not selected.

Wis., Eau Claire—The Enterprise Oil Co., 401 Bay St., Chippewa Falls, has awarded the contract for the construction of a 1 story, 60 x 70 ft. garage, etc., here. Estimated cost, $40,000.

Wis., Kenosha—J. Lindl, Archt., 209 Wisconsin St., is receiving bids for the construction of a 1 and 2 story, 60 x 100 ft. garage on Milwaukee Ave., for Krisor Bros., 772 Milwaukee Ave. Estimated cost, $42,000.

Wis., Merrill—The Trantow Bros. Garage Co., c/o A. Trantow, has awarded the contract for the construction of a 1 story, 52 x 120 ft. garage on 1st St. Estimated cost, $40,000.

Wis., New London—F. Schoenrock is having plans prepared for the construction of a 1 story, 60 x 100 ft. garage on Main St. Estimated cost, $45,000. Private plans.

Wis., Sheboygan—A. Locke, 1819 Calumet Rd., has awarded the contract for the construction of a 1 story, 46 x 142 ft. scrap iron factory on Calumet Rd. Estimated cost, $6,500.

Ont., Guelph—The Bd. Educ. has awarded the contract for the construction of a 2 story, 100 x 285 ft. technical school on Paisley St. Estimated cost, $262,500. H. J. Leadlay, Secy.

Ont., Listowel—H. E. Cavell, Ridgetown, plans to build a machine and general repair shop, here. Estimated cost, $5,000.

Ont., Port Colburne—The International Nickle Co. plans to build a 90 x 140 ft. addition to its factory, to be used for refining nickel and platinum. Architect not announced.

Ont., Toronto — **The** Gotfredson-Joyce Corp., Ltd., Walkerville, has awarded the contract for the construction of a 2 story, 51 x 210 ft. garage and service station on Spadina Ave. here. Estimated cost, $91,000. W. H. Leishman, 106 Jarvis St., Toronto, Mgr. Noted Nov. 24.

General Manufacturing

Cal., Sacramento—The State is having revised plans prepared for the construction of a printing plant on 11th and O Sts. Estimated cost, $140,000. W. F. McClure, Forum Bldg., State Archt.

Fla., West Palm Beach—The Palm Beach Creamery Co., plans to build a 2 story dairy and ice cream manufacturing plant, to consist of several units, on Okeechobee St. Estimated cost, $50,000. O. J. Williams, West Palm Beach, Archt.

Ia., Muscatine—The Muscatine Packing Co. has awarded the contract for the construction of a 5 story 100 x 200 ft. cold storage building; a 5 story, 50 x 100 ft. packing plant; a 5 story, 70 x 85 ft. abattoir and a 1 story, 50 x 100 ft. power house. Estimated cost, $200,000.

Ill., Chicago—The Atwell Printing & Binding Co., Sherman and Polk Sts., has awarded the contract for the construction of a 6 story, 170 x 177 ft. printing plant on Prairie Ave. and 20th St. Estimated cost, $700,000. Noted April 13.

Mich., Detroit—The Mills Baking Co., 5165 4th Ave., has awarded the contract for the construction of a 3 story bakery plant on 4th Ave. Estimated cost, $40,000. Noted April 6.

Minn., Mankato—The Mankato Co-operative Dairy Assn., will receive bids until May 1 for the construction of a 2 story, 50 x 122 ft. creamery. Estimated cost, $40,000. Schippel & Schmidt, Mankato, Engrs.

Minn., Minneapolis—The Strutwear Knitting Co., 731 East 14th St., has awarded the contract for the construction of a 2 story, 80 x 82 ft. factory on 6th St. and 11th Ave., S. Estimated cost, $50,000. W. A. Struthers, Secy. Noted Oct. 20.

N. Y., Binghamton—W. P. Hollingshead Co., 148 Oak St., plans to build a 5 story, 80 x 330 ft. chemical plant on Walnut St.

N. Y., Brooklyn—The General Baking Co., 348 Madison Ave., New York, has awarded the contract for the construction of a 2 story, 163 x 200 ft. bakery and a 2 story, 59 x 62 ft. stable on 149th St. and Girard Ave. here.

N. Y., Rochester—The Yawman Erbe Co., 424 St. Paul St., plans to build a 3 story factory for the manufacture of office furniture. Estimated cost, $100,000. Smith, Hinchman & Grylls, 710 Washington Arcade, Detroit, Mich., Archts.

N. Y., Rome—F. W. Kirkland, Archt., 103 West Dominick St., will receive bids until May 1 for the construction of a 2 story, 40 x 90 ft. milk pasteurization and bottling plant for the Rome Milk Corp. Estimated cost, $50,000.

O., Dayton—J. Newbauer Sanitary Milk Co., 18 Maryland Ave., has awarded the contract for the construction of a 2 story milk bottling and butter making plant on Herman and Maryland Aves. Estimated cost, $50,000.

Pa., Phila.—The Peerless Paper Box Co. has awarded the contract for the construction of a 2 story, 54 x 84 ft. addition to its factory at 1432 North Randolph St. Estimated cost, $50,000.

Pa., Pittsburgh—The St. Louis Independent Packing Co., 6349 Station St., is receiving bids for the construction of a 2 story, 106 x 109 ft. cooler building on Hamilton Ave. Private plans.

Tenn., Jacksonville — The Nashville Paper & Pulp Co. recently organized and chartered with $1,000,000 has leased several buildings and will erect several units for the manufacture of paper and pulp, at the Old Hickory Powder plant. R. G. Cullem, Engr. and Genl. Mgr.

Tenn., West Nashville—(Nashville P. O.)—Colyar Reese & Co., Memphis, plans to build a wholesale oil distribution depot here. Estimated cost, $100,000. Above company transferring from Memphis to West Nashville and will be operated here as Southern Oil Marketing Co.

Wis., Antigo—The Mattefs Bros. Co. is having plans prepared for the construction of a 1 story, 60 x 120 ft. saw mill on Main St. Estimated cost, $50,000. G. Mattefs, Pres. Private plans.

Wis., Blair—The Blair Canning Co., c/o A. J. Bee, is receiving bids for the construction of a 2 story, 50 x 70 ft. canning factory on Main St. Estimated cost, $25,000. Private plans.

Wis., Holmen—The Holmen Creamery Assn. is receiving bids for the construction of a 1 story, 72 x 72 ft. dairy. Estimated cost, $30,000. V. S. Keppel, Mgr. Private plans.

Wis., Lake Geneva—The Mann Candy Co., c/o F. Mann, has awarded the contract for the construction of a 2 story ice cream factory. Estimated cost, $10,000.

Wis., Manitowoc—The Manitowoc Products Co., 1008 Washington St., has awarded the contract for the construction of a 3 story, 50 x 70 ft. ice cream factory on Washington St. Estimated cost, $10,000.

Wis., Milwaukee—The Quality Dairy Co., 2347 Hadley St., has awarded the contract for the construction of a 2 story, 40 x 80 ft. dairy on Burleigh St. Estimated cost, $20,000. Noted April 6.

Wis., New London—Hamilton & Sons Canning Co. plans to build a 2 story, 50 x 75 ft. cannery. Estimated cost, $50,000. Architect not selected.

Wis., Park Falls—The Flambeau Paper Co. has awarded the contract for the construction of a 75 x 110 ft. paper mill. Estimated cost, $100,000. G. Waldo, Mgr. Noted April 6.

Ont., Acton—Beardmore & Co., 37 Front St., E., Toronto, is having plans prepared for the construction of a 3 story, 80 x 100 ft. tannery, here. Estimated cost, $100,000. Private plans.

Ont., Brantford—F. C. Bodley, Archt., Commercial Chambers, is receiving bids for the construction of a 2 story, 50 x 140 ft. dress goods factory, for the Dominion Dress Goods Co., 179 Dalhousie St. Estimated cost, $75,000.

Ont., Hamilton—The Kanadda Biscuit Co., Ltd., 185 West Ave., N., is having plans prepared for the construction of a 2 story, 80 x 400 ft. bakery. Estimated cost, $200,000. B. H. Prack, 1 Main St., E., Archt.

Ont., Niagara Falls—The Brant Creameries Co. is receiving bids for the construction of a 2 story, 40 x 80 ft. plant on Simcoe St. Estimated cost, $50,000. Architect not announced. Noted March 30.

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Factory Storekeeping and Material Control

The First Article—How Material Control Is Related to Production—The Ideal Material System—Losses from Excessive or Deficient Supply

BY HENRY H. FARQUHAR

A MANUFACTURING establishment, as the name implies, exists primarily for the purpose of turning out a product for sale at a profit. This fact curiously enough seems sometimes to be overlooked. Activities, other than production proper, are of course necessary in order that the main purpose for which the plant exists may be accomplished and it is necessary, in order to avoid an unevenness in management, that each activity be seen in true perspective to every other activity without misleading lights and shadows.

> THIS is the first of a series of seven articles. It shows the dependence of production upon material regulation.
>
> The next three installments will deal with the personnel, organization and location of departments, the balance sheets and the purchasing department, as related to material control.
>
> The last three installments will take up storeroom layout, equipment, stowage and protection, and maintenance stores.
>
> Material control is a production function and should be governed by requirements for production during reasonable future periods.

The main functions in the administration of any manufacturing undertaking are:

The financing and accounting, or the raising and regulation of funds by which the business is carried on.

The engineering or technical which determines the design and composition of the product.

Selling which creates a demand for and disposes of what is manufactured.

Personnel which has to do with the policies and practices grouping themselves about the human element.

All minor activities of the plant may be grouped under one or another of these broad major functions, and all, it must be remembered, spring from and must primarily serve production since this is the activity for which the whole establishment was founded. Looking at the matter in this light, the production function really embraces finance, engineering, selling and personnel. But it may in turn be subdivided into those activities with which it is more specifically concerned in turning out a product through the use of land and buildings, equipment, layout, organization, materials, production cost systems, and so on.

Now, if we have learned anything from the great amount of careful work which has been done in an attempt to reduce the management of industry to less of an art and more of a science, it is that the control of one of these variables with which the manager must deal is just as necessary as the control of any other and that the business must be looked upon as an organic whole and not as a series of disjointed and unrelated activities. This viewpoint brings home at once the fact that none of these production activities can continue unless selling provides a market, that machines are useless unless power is available to drive them, that men are useless unless they be provided with work to do and with facilities to do it, and that in turn all of these activities must cease unless materials are supplied as needed. The function of material supply, instead of being relegated to the background and considered as a necessary evil, must thus take its place alongside of those activities ordinarily given greater consideration. Only by so doing may a balanced management be brought about. Only when material regulation has been standardized may it be pushed to the background to make room for some of its brothers which are less amenable to control. One of the major activities of production, then, is to provide its needs in materials. It is only through the conduct of manufacturing operations that the material problem in the strictly manufacturing business originates. Eliminate the production activity and the need of materials, aside from miscellaneous office supplies and the like, disappears.

From a material standpoint the fundamental idea upon which war is conducted is so to organize and manage that the man at the front is enabled to keep his mind continuously on his main duty—the defeat of the enemy—without being handicapped with questions of supplies of any kind. He should absolutely forget the material. Ideally and actually he should be able to reach his hand behind him at any time and receive exactly what he needs—no more, no less—at the moment. An oversupply will impede his actions, consume his time and attention and result in waste. A deficiency will render him helpless. That is the basis upon which the supply service of the army is organized. Material and ration supply should be automatic and governed absolutely by current needs.

For the man at the front substitute the man at the machine, and the above ideal becomes that of the supply service in the factory for the same reasons, and to be attained through the same considerations.

For the author's forthcoming book.

Now, to make this supply automatic in either case, we must first know the requirements. We must know the original outfit that a man needs when he takes up his work and the probable rate of use of each article while on the job. Then, if we are to send forward the right quantity of the right materials to him at just the right time, many other things are necessary. We must know how long it takes to secure the goods from our supplier, and how long it takes us to forward them from ourselves to the man who is to use them. We must know how much of the goods we have on hand in our storeroom, how much we have ordered to be shipped to us, how much has been promised for specific uses and therefore will not be available for filling subsequent requests, and we must know from this how much is still available for future demands. Besides these things, to make the supply reliable we must have a definite location for each article of goods in stock, to know exactly where and how much of each is on hand, and to be able to get them in and out quickly.

This requires that means be taken to safeguard materials in storage and to keep accurate records of amounts. We must have accuracy in handling, have all items checked all the way down the line as much as we possibly can consistent with speed and with the men with whom we work. Theoretically no goods may pass out of one's hands without a receipt. This is not always possible in war, or necessary in war or industry. But we must have efficient transportation and sufficient checks at each stage of our transportation. We must, therefore, have proper identification of the goods so as to enable anyone into whose hands they pass, to know what the goods are and for whom they are intended.

In addition to all these considerations of quantity and time, we also have both in war and in industry considerations of quality, and in addition to this in industry we have the further consideration of cost. By this is meant not simply the original purchase cost, but the final use or time cost considering the effectiveness and durability of the particular item in actual use.

These are a few of the many details to be brought under control in well-regulated material handling. They are not matters to be looked after by an inexperienced clerk, nor left to the supervision of otherwise preoccupied officials or those who, because their duties do not bring them face to face daily with production troubles, may not realize the vital dependence of manufacturing efficiency upon material control.

There is, strictly speaking, no such thing as a material function in itself in the manufacturing business. Those manufacturers who, in addition to producing, deliberately indulge in the buying of materials for resale and playing the market are by so much engaging in a separate line of business as distinct as possible from that for which presumably their investment in plant and equipment was made. It is a dangerous speculative business in which, in many cases, it is better not to indulge. Even though a conscious buying for resale be not permitted, there are many plants which are in even a worse condition, because, lacking this definite speculative policy, they have failed to substitute the proper one of governing purchase from the standpoint of manufacturing needs.

The tendency in the best plants today is to look upon the control of material as a production function and to govern the replenishment of materials by the requirements for production during a reasonable future period. One of the oldest, largest, and most progressive metal-working plants in this country adheres steadfastly to this policy, and has done so for a number of years.

The vital dependence of manufacturing efficiency on the strict regulation of materials is most realized by those closest to and responsible for production. Although a blunder on the part of the purchasing agent, for example, may result in just censure of that individual, it is after all production which has to bear the cost of the blunder. The cost of what he buys, as well as the cost of his failure to buy when he should, alike must eventually be borne by the cost of the product turned out. This is regardless of the cost methods used. Even where a so-called standard or predetermined cost of material entering the product is used, and where any excess over this cost is charged to profit and loss, the balance sheet must yet show that articles produced are sold at more than all costs of producing them, blunders included, or the business must eventually discontinue. We only obscure the approach of the evil by absorbing such losses in a separate account.

> **ALL COSTS are the costs of production. The only economic justification for storing materials in quantity is that through this reservoir production may be regularized and cheapened.**
>
> **Excessive supply means loss in interest and insurance, excess storage space rent, deterioration, reduced stock turnover, additional handling and confusion.**
>
> **Deficient supply stops production. One occurrence may offset many times the cost of excessive supply.**

Production must, therefore, suffer, in addition to leaks, any evils of over- or under-stocking. Curiously enough both of these losses are most often encountered in the same plant simply because insufficient attention is paid to material problems in general.

The only economic justification for storing materials in quantity is that through this reservoir production may be regularized and thus cheapened. It therefore follows that the cost of the product must not be unduly increased through storing too much nor through failure to store enough. In either event, production is not securing the benefit of storage to which it is entitled. There are but two ways in which materials may be sold at a profit. They may be resold in the condition in which they were bought at higher than the purchase price, or they may be processed to a finished or partly finished state and sold for more than the cost of raw material plus manufacture. Obviously excess materials cannot be processed, which leaves us only the first alternative of resale, as before stated a questionable policy for a manufacturing concern.

The now classic case of a government establishment may be recalled in this regard. There was here, of course, no element of speculation, but the loose methods of regulating materials then prevalent and still common, were in use. Upon the initiation of changed methods of management, the stores situation was thoroughly

overhauled. Among other things which came to light was a supply of materials above current needs amounting to over $122,000. This occurred in a government institution, however, for which allowances must be made.

Let us look at some happenings in private plants. I can personally vouch for the accuracy of these stories, although, of course, names cannot be mentioned. In a machine shop, upon a similar round-up forty tons of idle stock were unearthed from around the machines, under the benches, and on the floor of one department. This consisted of raw stock cached by the workmen, excessive amounts delivered to the machine and not disposed of, partly worked parts sidetracked for "rush" jobs, and so on. There was no speaking acquaintance between material regulation, either purchasing or issuing, and production needs.

Buying For Current Needs

In one plant I was informed that the purchasing agent bought only for current needs as judged from comparison of reports of materials on hand and sales orders which were furnished him. Because the responsibility for such matters was so placed and because of the methods used, his ability to buy for current needs was questioned although he surpassed the average purchasing agent in capability. An actual investigation showed over $50,000 worth of excess miscellaneous items on hand. Any of these items could have been secured in three weeks, and some were on hand in sufficient quantities to last ten years. The intent was good in this case, but human limitations and faulty details made its accomplishment an impossibility.

The purchaser for one medium-size factory was a bargain hunter, one of the most costly and tenacious diseases to which purchasing agents' flesh is heir. Responsibility for designation of how much to buy had, up to this time, never been clearly defined, and was usually exercised by the purchasing agent alone who originated and approved replenishment orders unless some special occurrence made consultation necessary. I remember very vividly how one morning he beamed into the office with the news that there had just been delivered 18 months' supply of a certain item which he had obtained at an "exceptional reduction in price." The works manager replied that they had just discontinued the use of that particular item altogether. In this case the material was immediately resold at a lower price than was paid for it. Such bargains often form very considerable portions of the excess supplies shown up when materials on hand are measured against requirements.

A somewhat elaborate stores system had been installed for keeping track of partly worked parts in another factory. Due to a multiplicity of detail whereby the main requirements of successful stores management, however, had been missed, the difference in inventory as shown on three supposedly accurate interlocking records was surprising. Material worth $15,000, as per the book records under the control of the cost department, could not be physically located or otherwise accounted for. Those entrusted with the work of record-keeping did not realize the importance of it and had no particular incentive to keep it accurately. The cost man regretted that it was necessary to write off such a loss, but otherwise attached no particular significance to the matter.

Akin to this is the case in another plant where, so far as I know to this day, the works manager in all important cases must send a personal representative to the storeroom to check the accuracy of the book balance reported to him from the balance sheets. These are under the control of the cost office.

Another case came to light in an otherwise exceptionally progressive factory. Because of fairly uniform production requirements, it was thought to be unnecessary to apportion, or reserve on the books, material for each manufacturing order in advance of its disbursement. Instead, the average consumption over a period of weeks was determined, to which was added a liberal factor for safety and the resulting quantity was specified as the minimum below which goods on hand should not be allowed to fall without issuing a replenishment order. This minimum was entered on the balance sheet for the item and book balances were carefully checked with bin contents from time to time. To give added assurance, over the minimum quantity in the bin was placed a red cloth as a signal to the storekeeper, before touching the minimum stock, to remind the balance clerk to issue a replenishment order.

This procedure seemed to be watertight, but after a few months' operation a costly shortage occurred on the item. Upon investigation it was found that recent demands had so far exceeded average demands upon which the minimum was based, that the stock became exhausted. Rather than increase the minimum limit to cover such exceptional demands and thereby increase the inventory of idle material during all times of normal consumption, the firm was persuaded to adopt the common-sense policy of looking ahead in these matters and apportioning all such material immediately the need became known.

No, efficiency in production cannot be obtained under such handicaps. Money is carefully guarded and checked to the penny. Materials are potentially of far greater importance to the manufacturing business than an equivalent amount of money. They should be as carefully guarded and controlled.

Losses from Excessive Supply

Excess materials undisposed of, cause any one or all of the following losses:

(1) Loss of interest on investment. The money which is spent for material in excess of what is needed for production during a reasonable period might otherwise be loaned at interest or reinvested profitably in the business, and might thus produce more money. Or it may be used to obviate the necessity of borrowing, and thus produce a direct saving. Invested in idle material, however, it adds a cost of doing business, the cost of the loss of interest on money needlessly spent.

(2) Loss of insurance on goods. A heavy inventory imposes a heavy insurance cost, or a heavy loss in case of fire, usually both.

(3) Excess storage space. Every cubic foot of storage space has a rental value. Taxes, insurance, depreciation and repairs on the building, interest on investment, heat, light, cleaning, all such costs for any space throughout the plant must be charged against what occupies that space, be it an operating machine or dead stock. This charge must eventually appear against the cost of the product which the space is supposed to benefit. In the former case, the product of the machine may offset, or more than offset, these rental charges. In the latter case the charges swell expenses which ordinarily cannot be returned by the

excess materials themselves and which therefore add to the burden which must otherwise be shouldered.

(4) Deterioration. In but few cases do materials of any kind retain their original quality during the passage of time. Deterioration, depreciation or obsolescense will sooner or later cause a loss in idle stock.

(5) Reduced stock turnover. During normal times of the buying and selling market the ideal condition as regards storage in the manufacturing business would be where no storage whatever is necessary. Imagine a factory where immediately upon receipt, raw material is delivered to the machine, processed at once and immediately shipped upon completion. Such a factory would have a stock turnover limited only by the time necessary for the longest operation on the product. The cost of material entering into the product under such conditions would obviously be less than where storage is necessary. In storing we have the costs mentioned previously, the cost of added delivery, handling and transportation charges, and possibly deterioration or obsolescence in the materials themselves.

No matter for how short a period we store, therefore, the cost of the stored article issued to the shop is actually greater, whether it shows on cost records or not, than is the cost of a non-stored article. The profit on the finished product is therefore less; or, if the same, that part of it which pertains to the materials occurs fewer times per year. It is more profitable to make 2 per cent per transaction six times a year than it is to make 13 per cent only once a year. This is a point overlooked in innumerable manufacturing and other concerns.

(6) Additional handling and confusion. Except under fortunate conditions of ample and well-arranged storage space, a supply of material in excess of normal needs almost inevitably results in shifting locations, additional piling, unpiling and transporting, additional record-keeping, lack of definite identification and consequent confusion and difficulty in finding materials quickly.

The losses which may and do result from a failure to have on hand just the article desired in sufficient quantity when needed are too frequent and obvious to merit rehearsal. A warning may be thrown in here, furthermore, to the effect that when a policy of governing materials strictly by production needs is determined upon, ample safeguards are necessary to insure against a shortage. One such occurrence may offset many times the cost of an excessive supply.

Material losses are also due to misplaced responsibility and faulty routine. Some typical instances of such losses were given in preceding paragraphs, and since the causes may be innumerable no summary will be attempted. It is largely the petty annoyances and little leaks, however, which in themselves are often insignificant, but which in the aggregate amount to infinitely more than it would cost to remedy them.

Progress of S. A. E. Standards Adoption in the Tractor Industry

The accompanying chart was exhibited at the recent National Tractor Show, at Minneapolis, by the Society of Automotive Engineers. It is based on replies to a questionnaire sent by the society to more than 100 tractor makers. On it are the names and symbols of the respective standards applicable to the tractor, and opposite each the number of tractor builders, as shown by the black spaces and expressed in per cent of the total number of replies to the questionnaire, who are employing them.

It is worthy of note by builders of other kinds of machinery that encouraging progress has been made by the tractor people in the adoption of standards that would be equally useful for other machinery. See, for example, the relatively large per cent of tractor builders who have adopted standard screw threads, lock washers, cotter pins, pipe threads, pipe fittings, grease cups, drain cocks, iron and steel specifications and annular ball-bearings.

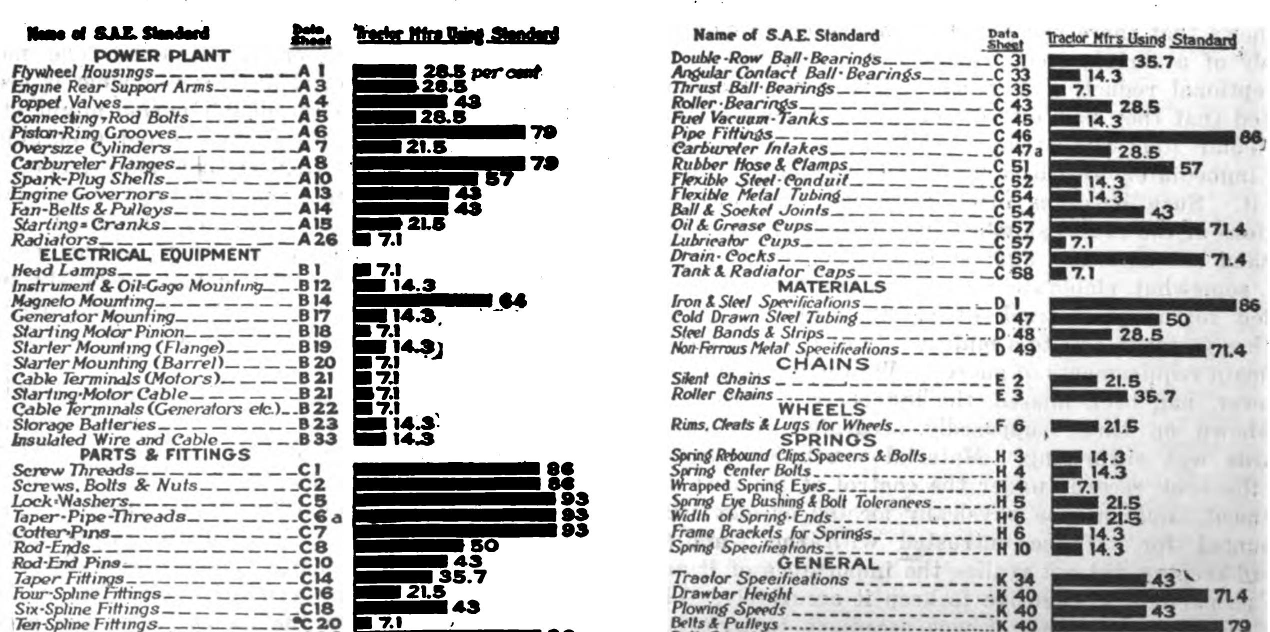


CHART SHOWING THE RELATIVE NUMBER OF TRACTOR BUILDERS USING THE SEVENTY S. A. E. STANDARDS APPLICABLE TO TRACTOR CONSTRUCTION

Methods of Machine Tool Design

Second Article—Making a Schedule for a Machine to Be Designed—Checking Each Step in the Design Before Proceeding

BY A. L. DE LEEUW

THE first step in the design of a machine tool is to go carefully over its requirements and make a schedule. In the case of a commercial machine this schedule takes the form of a set of specifications. In the case of a special machine it takes the form of a schedule of consecutive operations to be performed by or with the machine.

Taking for example the machine for finishing the part shown in Fig. 1, and which has been analyzed to a certain extent, the schedule should be something like this:

(1) Chuck piece.
(2) Mill top and pass cutter completely over work, bringing the cutter slide against a stop.
(3) Drill three holes.
(4) Return drills to starting position.
(5) Return cutter slide to starting position.
(6) Loosen clamp and remove piece.

Select a proper arrangement for each of the functions. In this case there can be but little doubt. We may not be sure as to the detail arrangement of the drill spindles, but we *do* know that drill heads are needed for the drilling operation, and a vertical spindle for milling (making a note that we will investigate the horizontal milling spindles later on). Our machine, then, consists of:

(1) Combined mill and drill head.
(2) Drill heads.
(3) Means for clamping.
(4) Mechanism for driving.
(5) Mechanism for feeding.
(6) Framework for supporting these items.

We now make a sketch of the arrangement like that in Fig. 4.

We then analyze each of these elements as far as we can without getting into interference with another element. It seems at first glance that the means for clamping the piece can be arranged without such interference.

As this is a special machine and special machines are not made except as a matter of economy, we will naturally develop some system of clamping which requires a minimum of time and of effort on the part of the operator.

One single movement for the purpose of clamping should be our ideal. If we do not succeed with this, then we should try two or three. We assume that the bottom and sides have been milled so that it will be possible to push the piece with its gage points against two stops. This locates the piece. Fig. 5 shows a tentative arrangement of the clamps.

A and *A* are the clamps which are parts of bell cranks, fulcrumed on *B* and *B*. The long arms *C* and *C* are operated by the toggles D_1 and D_2. The foot lever *E*, fulcrumed on *F*, operates these toggles.

Having this first conception of the clamping mechanism we check it up to see if it will act properly, and find right away that depressing *E* will move D_1 to the right and D_2 also to the right, so that one clamp would close and the other open. This brings before us the necessity of moving the point *G* in a vertical line. We can do this in various ways: For instance, by a rack guided in a vertical direction and moved by a pinion or gear sector, centered on the fulcrum of the foot lever. However, should we do so, both levers *C* would get an equal amount of movement and, as the clamps bear on rough surfaces, only one of them would act. To overcome this, in other words, to equalize the clamps, we introduce link *H* and place the foot lever in position *I*. This will effectively equalize the pressure of the two clamps *A* and *A*. We now check the mechanism to see if there remains anything needing attention. We notice that the point *G* must never get above the lower joint of lever *C-C*. In other words, the toggle must never get over the center; and, as the amount of movement is rather uncertain, due to the fact that the clamps bear on rough surfaces, it may well be that the point *G* remains quite low when the clamps are down. If this should happen, there would be nothing to keep the clamps from opening.

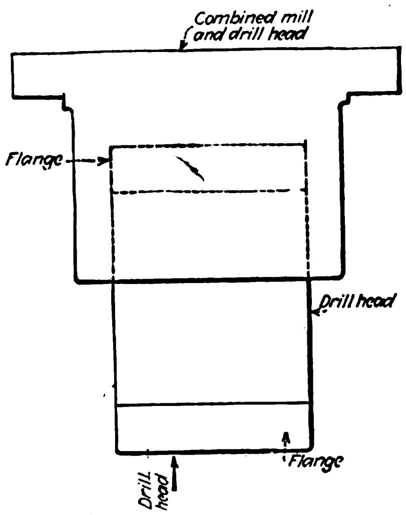


FIG. 4: SKETCH OF MACHINE ELEMENTS

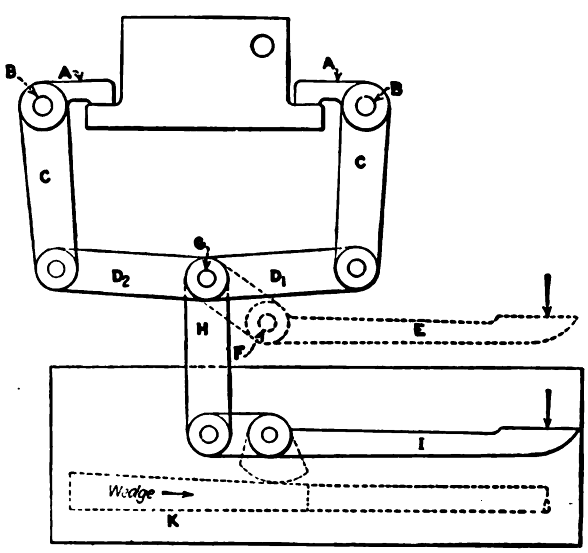
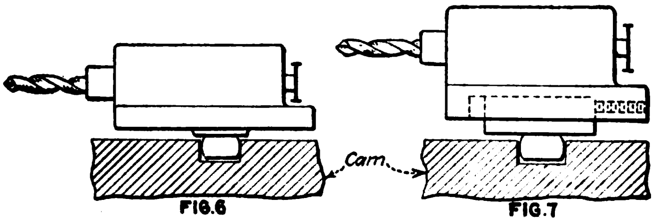


FIG. 5. SKETCH OF CLAMPING DEVICE

For the author's forthcoming book.

Our next problem, then, is to make some provision for holding the clamps after the foot is removed from the foot lever. This could be accomplished in a number of ways. As a first attempt we will provide a wedge *K* bearing against a projection of foot lever *I*. The wedge *K* will be moved by means of a hand lever, so that the clamping operation will consist of bringing down foot lever *I* and then pulling the hand lever. We sketch this out, as shown in Fig. 5, but, when checking it up, we find that the wedge placed as shown would have a tendency to push the foot lever back again and so open the clamps. We therefore reverse the wedge and operate it in the reverse direction from that shown. We would naturally correct our sketch, but will not show it here to save space.



FIGS. 6 AND 7. ARRANGEMENT OF DRILL AND SLIDE

The important thing to remember is to check up carefully each new step. As this checking up is perhaps the most frequent operation in the design of a machine, a few extra words may be timely.

In checking up the function of a mechanism we should let the operation of the various parts pass in our minds at a very low rate of speed, and imagine them to stop the moment a slightly different action takes place. In our case of the wedge, we would imagine it to be so far to the left that it does not yet touch the projection of foot lever *I*. We move it slowly to the right until it touches this projection. We move it a little bit further to the right, keeping our eye on this point of contact. We will watch what will happen and see, of course, that, there being considerable friction between wedge and projection, the wedge is liable to take the projection with it, and we notice that this will move the foot lever in the direction for opening the clamps.

This slow checking up of the functions of a machine should never be forgotten. It may take considerable time where the mechanism is complicated, but it pays to do it. There would be a great many other ways of accomplishing the purpose of holding the clamps in position. We will always find that there is more than one way of accomplishing whatever purpose we have in mind, and it is well to sketch out, or at least keep in mind, a few varieties and compare them after we have each one worked out to a point where comparison becomes possible. However, for the purpose of this treatise, and considering the amount of space available for it, we will confine ourselves to one single example.

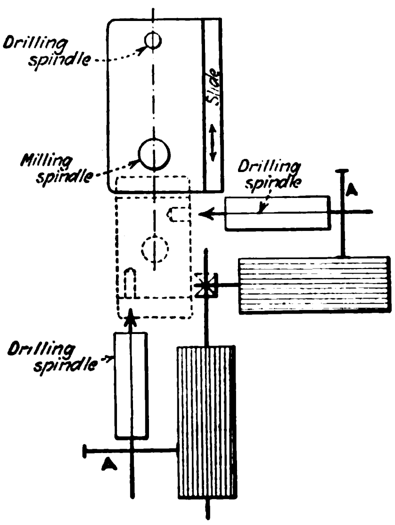


FIG. 8. PROGRESS DIAGRAM OF MECHANISM

The fact that we had to do something to keep the clamps in their working position brings up to us the desirability of finding some construction which would not require such a secondary operation; something which in itself would make the unclamping impossible. Of course, the only way which would be absolutely certain would be to keep our foot on the treadle with the full pressure exerted for the clamping operation. This, however, would be uncomfortable for the operator and would prevent him from moving away from his working position. However, any other means which will keep the link *H* under its initial pressure will be equally good and we naturally think of an air cylinder or hydraulic cylinder or of some other mechanical means for exerting pressure to take the place of the foot lever. And so we might remove that portion which is blocked out in the sketch and substitute for it a double-acting air cylinder of which the piston rod is connected to link *H*. What this example shows so far is the possibility of working out a more or less complicated problem without ever considering more than one thing at a time. And this is perhaps the most essential point in the method of designing machinery. So far we have paid no attention to sizes, proportions, locations, or anything else which would make our mechanism directly applicable to the machine we designed, but we will not go into this matter just now, rather taking up the other elements of the machine and bringing them to the same point of completion.

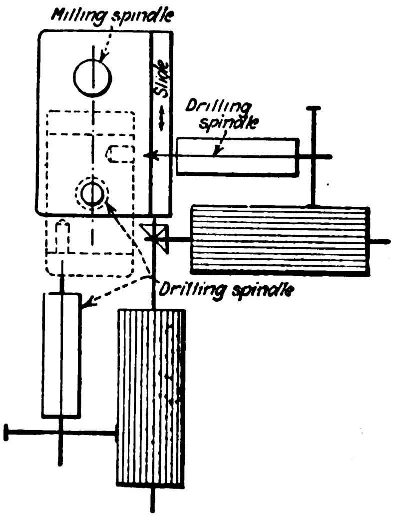


FIG. 9. CORRECTED DIAGRAM OF MECHANISM

Analyzing the requirements of the drill heads we find that each head must be capable of drilling one hole to a certain depth and return, and further that each head must be adjustable to make up for various lengths of drills. As only one size hole needs to be drilled, only one speed is required, and though the speeds of the two drill heads may be different yet both heads may be similar in construction and possibly may be exactly alike. If, for instance, one hole should be $\frac{3}{16}$ in. and the other 1 in., we would probably have to make two different sizes of drill heads; but if the one hole were $\frac{3}{16}$ in. and the other $\frac{1}{4}$ in., there would not seem to be any reason why we should not make both heads the same. Assuming that in our case the two holes are of near enough equal size to permit of the use of the same drill head, we will now investigate the construction of this head.

We will put the drill spindle in a simple slide and key a gear to the end of the spindle for its drive. As the depth of hole to be drilled is always the same we do not need a complicated mechanism for feeding it in to the required depth but can use a simple cam, and we will provide this slide with a roller upon which a cam can work. See Fig. 6.

This arrangement seems to fulfill all the requirements

of the drill head, except that it has no adjustment for various lengths of drills. There are quite a number of ways in which we could take care of this adjustment. For instance, by putting the drill in a chuck or holder which is adjustable in the spindle. Such a construction is often used. Another construction for the same purpose would be to put the drill spindle in a sleeve and make the sleeve adjustable in a longitudinal direction. Still another construction is to make the position of the cam roller adjustable in the drill head. We will assume that conditions are such as to make the last mentioned construction the most attractive. Fig. 7 is a sketch which we will make of this selected construction. A roller is attached to some piece or slide which is adjustable by means of a screw and, of course, must be clamped in the drill head. We are not at all sure yet as to what exact form we will give to this slide, and this is not yet necessary. It is better not to have very definite ideas as to the form and details of a construction too early.

The drill head as we now have it meets all conditions. It has a spindle, a drive for the spindle, it is guided in a slide—not shown in the sketch—there is a cam and roller for the feed, and there is means for adjustment.

Analysis of Construction

We should now analyze this construction and see if we are liable to get into trouble at any point. It is easy to carry out all the details of the construction, but there seems to be one point where we have missed connection. We have a driving gear at the end of the spindle but we have no means of operating it. This seems, then, to be the next item of which we should take care. And so we produce the sketch in Fig. 8 which shows the two drill heads in diagrammatic form and also the double drilling and milling head. Realizing that the gear *A* moves in the direction of the spindle, either on account of the feed or on account of the adjustment, we see that we must drive it either from a sliding gear or from a long pinion. Which of these two we will prefer will probably depend on the amount of movement. If this amount is relatively small the long pinion will be a simple construction, but if it is great we will probably have to use the sliding gear construction. We will make our sketch with the long pinion and make a mental note of the alternative construction.

Seeing the relative position of the two drill heads makes us automatically think of the way of driving these two heads from one source, and the construction shown in the diagram looks natural to us, though we realize that the location of the parts may make it necessary to modify this construction somewhat.

We now check this latest addition to the construction of the machine. If the two drills are to run at the same speed we will be able to use the same gearing on both drill heads and miter gears at the junction. If there is a relatively small difference in their speeds we will make up this difference by substituting bevel gears for miters, and as we have assumed that the two drills are of very nearly the same size, we do not need to look further into this matter. We have taken care of the common drive and the relative speeds. We must now check up the directions. We notice that if one of the two drill spindles turns in a right-hand direction the other drill spindle will turn left-hand which, of course, is not permissible. We can correct this by adding an idler to one of the two drill heads, but as we wish to make the drill head serve in both cases this solution is not desirable. Another way of meeting the problem is to change the relative location of the bevel gears as indicated by the dotted lines.

We must now consider the combined milling and drilling head. Our first conception of this device is shown in Fig. 8. The direction of the slide is such that we can use a small cutter. If we had placed this combination opposite the other drill head a larger cutter would have been necessary. Of course, our first consideration is to use such a cutter as will produce the piece in the least amount of time. At a first glance it might seem that the larger cutter will give this result, because the distance to be traveled is less. However, it is not possible to say with certainty which way will give the greatest economy of time unless we know the dimensions of the piece we mill. For the sake of clearing this matter up somewhat we will assume that the dimensions of our piece are 2 x 4 in., and that we will use a 2½-in. cutter going the long way and a 5-in. cutter the short way.

If we use a 2½-in. cutter and we must traverse a piece 4 in. long (and being a rough casting it may be a shade longer), we should allow for the length of the piece plus the diameter of the cutter and a little for clearance—say altogether 6¾ in., and if we should mill the other way, 2 in. plus 5 in.—say 7¼ in. It is obvious that feeding in the direction of the length of the piece is more economical because we have a smaller cutter traveling a shorter distance.

The writer, being in possession of all the facts, may just as well divulge the secret now; it will save him reopening this subject later. We will find that it is not necessary to have the cutter travel farther than needed to bring its center over the far edge of the piece. In that case the small cutter would travel 5¼ in. and the large cutter 4½ in. On the other hand, the speed of the small cutter, meaning the number of revolutions per minute, may be twice as much as that of the large cutter; and as the length to be traversed by the small cutter is not nearly twice as much as that to be traversed by the large one, it is evident that the arrangement as shown on the sketch is the more economical.

We have arbitrarily assumed, at least in the sketch, that the milling spindle leads. So far we have no reason to take for granted that this will make the best arrangement, and therefore, before we look into the details of either the milling or the drilling spindle, we will determine what is the most economical way of placing them.

If the relation is such as shown in Fig. 8 the milling spindle must advance not less than 6¾ in. before the drill spindle can begin to work, because we would not dare to leave the milling cutter over the work while the drill spindle is drilling. This also means that we must feed not less than 6¾ in. Anything we can do to reduce this amount of feed will speed up the operation and will make a number of the elements of the machine, such as cams, of smaller dimensions. If, on the other hand, we should make the drill spindle the leading one, and if the position of the rest of the combination slide were such that the drill spindle is immediately over the hole to be drilled, as shown in Fig. 9, the amount of feed we would need would be the radius of the cutter plus the length of the piece. After milling, the slide would return to its original position and the drill spindle would begin to work. This amount would be 5¼ in. which is considerably better than 6¾ in. For this reason we will change the proposed construction to that shown in Fig. 9.

(*Continued in next week's issue*)

Economic Aspects of Standardization

Mass Production and High Wages Impossible Without Some Standardization—Technical Excellence of One Standard May Be Out-weighed by Economic Value of Another

By E. F. DuBRUL

SINCE the discovery of the great inventions and the beginning of the industrial revolution that was going on about the time of the American Revolution, modern industrial processes have developed more and more through the division of labor. The individual workman is no longer producing the whole product that the consumer finally gets; but almost every article that is used anywhere is the work of many hands.

In the United States, with relatively high labor costs, mechanical processes have developed to the fullest extent the general system known as "mass production." This means that industries as a whole are not self-sufficient, but are interdependent, depending for their supply of materials and parts on some elements, and for their demand on entirely different elements of our people. This very fact requires standardization, so that the buyer of supplies can know when he buys from several sources, as he should for his own protection, that the pieces bought from the different sources will equally serve his purposes; that means that they are standard, as far as he is concerned.

But other reasons exist why the same pieces should and do become standard for their users. These reasons also are reasons of cost, which, by mass production, is greatly reduced, as every one knows. Cheap production depends on quantity production. Quantity production makes possible the gathering together of engineering and supervisory talent and it better organizes and directs a given body of men. It also permits better training of men in certain operations, and the raising of the standard of skill by specialization. In addition, it permits the production of goods of better quality, due to the fact that besides making the individual workman more skillful on specialized operations, it permits the design and production of machinery and appliances into which is fixed, once for all, the skill of the most expert workmen. This principle is known as the transference of skill and the transference of thought from men to machines. The automatic screw machine is of course a leading example of the embodiment of this principle.

Commercially, in addition to cheapness, it makes for a wider market; and there is the element of prompt delivery. The manufacturer of a standardized product can better afford to keep in stock large quantities of such product than he could products that are not standardized and whose demand may therefore be entirely eliminated by some change in taste or desire. This risk must form an additional element in the cost of the manufacture of goods that are not standardized.

> STANDARDIZATION and simplification are the order of the day. Long a desirable development from the competitive scramble where differences between various allied products scarcely merited the name of distinctions, they are coming to be recognized as essential to our existence.
>
> It will be the engineer's job to suggest the models and types on which to concentrate but the economist's task to select the best from the viewpoint of securing the greatest good for the greatest number. Many pet preferences must be swallowed or compromised before the desired end is achieved, but if it is possible for the statesmen of the great powers to agree on such points as distinguished the recent disarmament conference, it should certainly be possible for manufacturers and users of paving bricks or machine tools to get together on matters of far less import.

Mass production of standardized parts not only reduces the direct cost, but the overhead costs as well, such as engineering and designing of the special tools and machinery that are used to make the standardized product. It reduces the cost per unit of office help and supervision all along the line; and this, in turn, becomes reflected in the lower price. Standardization reduces the amount of capital required to operate the business using standardized parts, because one sure effect of standardization is to reduce a large variety of pieces to a few fixed kinds.

In one industry, where ninety-six different kinds of certain parts were found to be produced, these have been reduced to nine. The producers of the ninety-six no longer have to have the special appliances, no longer have to carry stocks and care for those stocks at great expense for storeroom labor in order to supply demands that, in many cases, were mere whims of the designers of the machines in which these parts were used. The nine standard parts could be produced in larger quantities and the prices of the nine standard parts soon fell to one-third of the former prices charged for any one of the ninety-six similar parts before standardization. Another effect is that increased accuracy of the standardized parts is obtainable with less expense than the inaccuracy of the unstandardized parts. This reason again lies in the principle of the transference of skill, because more accurate duplication and better interchangeability can be obtained, the larger the quantity to be produced; this again being due to the fact that with the larger quantity to be made greater investment is justified, in special machinery of a better character, such as is needed to produce the better accuracy.

The agricultural machinery manufacturers, in surveying their own situation, found many kinds of cast-iron seats used on agricultural implements. The mere disclosure of this situation was sufficient to demonstrate that it should be changed. This situation had grown

so that even in the same company, a mowing machine had one kind of seat, a hay tedder, that was used a few hours afterwards, had a different seat, and the hay rake had still a different one. Perhaps even now, the manufacture of seats may be taken out of the agricultural implement concern's own foundry and someone will specialize on those, selling the product to all manufacturers of agricultural implements, at a price cheaper than they could afford to make them themselves. The adoption of standardized usable parts on different machines, as in this case, greatly reduces the number and kinds of parts within the industry. The more standards are adopted that fit diverse industries, the more will the benefit of standardization percolate through our whole industrial system.

Standardization makes for interchangeability of repair parts and better service to the consumer. The automobile industry has demonstrated this in many ways. The automobile supply house now carries standard parts of many kinds that, with a very few sizes, enables the user of automobiles to procure certain repairs almost anywhere. If the same methods were adopted, for instance, in the agricultural implement line, much good would result to farmers. Instead of waiting for some part to come from the factory, because it is special to the extent of a slight variation in dimension from another part, the hardware store could act as a service station for all sorts of implements and carry stocks of standardized parts, as the automobile supply houses do.

The determination of standards is a matter that requires the best thought, because as standards are adopted and come into common use a change becomes exceedingly difficult. Therefore, before adoption, careful study should be made of the proposed standards that they may be the best that it is possible to obtain for the purpose intended. This requires, in some cases, quite extensive research on seemingly simple things. At times it requires a compromise, because situations are found that, while one thing is the best, another thing somewhat less desirable has come into such general use that the cost of change would be prohibitive and would greatly exceed any benefit that the better standard would present over the poorer one. It is a matter of relative worth of one to the other, balanced against the cost of the change.

Arguments Against Standardization

At times some men raise the question that standardization is disadvantageous because standardization fixes practice in certain grooves and this prevents progress because the designer of the improved machine, or what not, is closely confined to the adopted standards.

This argument is very likely to be over-done. If any material progress is possible by deviation from a previously adopted standard, the newer and better standard would and should displace the older and less adequate. The passion for self-expression in design is not always true progress. Slight variations are frequently confused with improvement. They look large in the eyes of the salesman who wants a "talking point," to show the ill-informed buyer wherein his machine is different from the others; but the same salesmen will not be able to demonstrate wherein his mere variation is any better than others. Such variation is, of course, not true progress. Even so, true progress, unless very radical and decidedly advanced, may cost too much in obsolescence of fairly adequate standard devices, including obsolescence of all the special machinery and appliances used to produce the previous standard articles. On the whole, the general experience of industry does not prove that the benefit of so-called progress is sufficient to overcome the benefit gained by the reduction in cost of standardized products through mass production.

Standardization in Machine Tools

As all interested in the machine-tool industry, either as users or producers, consider the questions of standardization, they will find many things in which standardization is desired.

First, there is the elimination of unnecessary sizes. It is said that lathes, for instance, can be bought from some maker or other in any interval of swing from 9 to 36 in., progressing by 1-in. steps. Certainly, no good purpose can be served by any such variety. This variety has come about through competitive conditions. Some buyers perhaps thought they wanted a lathe of 19-in. swing because an 18-in. was just a trifle too small for their work, and some lathe builder, hungry for orders, stood ready to supply the 19-in. machine at a few dollars less than his previous standard 20-in. machine. So another size was added to his line. Or else there was some new competitor who thought to slip between the previously established intervals and gain trade from both, and rather than make two designs, one for 18-in. and one for 20-in. swing, made only one design for 19-in. Then the old competitor perhaps raised his head and tailstocks only 1 in. and he too offered his 18-in. machine to swing 19 in. So it went, until today the usual designations of lathes mean very little. Eighteen-inch lathes do not generally swing 18 in., but considerably more. This makes the problem of purchasing that much more complicated. It does not affect the small jobbing shop which can use a second-hand lathe, many years old. The difference in price between an 18- and a 22-in. lathe would be very slight on the second-hand market. But it does prevent the standardization of equipment in manufacturing shops, working themselves on mass production.

We saw the results of this during the war. Unable to get machines of the same make to the fullest extent required in a given shop, the buyer had to take the nearest thing he could get, and what he finally got was a collection that, for variety of sizes, might be the fair beginnings of a museum. This one element of variation in size could have been largely avoided had recognized standard sizes been accepted and adopted.

So it went through many other lines of machine tools. No study had ever been made to determine the actual preference of users as disclosed by sales. If such information had been available, the machine-tool industry, in co-operation with the users, could have laid down certain standard sizes in as great variety as were economically demanded; and these, when accepted as standard sizes, would have controlled that situation. Today, the demands of users can be made manifest through the American Engineering Standards Committee. After investigation that will disclose what the user has preferred to purchase, and also after investigation of what variation in sizes is actually desirable, the unnecessary sizes can be discouraged, much to the benefit of both producers and users. As a class, the users eventually pay for all the waste that arises from unnecessary multiplication of sizes. If they did not, the producers could not long exist. If this waste is saved,

its amount can be diverted to the production of other commodities.

American industry can retain its relatively high wages only with relatively high production per dollar of wages. This, in turn, can be obtained only through greater standardization to make mass production possible. Therefore, standardization has a decided interest for the consuming elements, who, in number and in amount of wages, form our greatest market.

If the product of the world is increased, the same percentages of the increased product going to wages and capital and management means a greater amount for all. We are like a family who has an apple tree in the yard of its house. Given the same climatic conditions, that apple tree will produce more and more apples as it grows older and larger, and each member of the family will have more apples, on whatever basis of division the family has adopted. But if the apple tree is stunted in its growth, or disease attacks it, or the frost in some years kills the crop, then the members of the family each have fewer apples.

Standardization is one way to increase the industrial crop of products. We cannot get more products for consumption, unless the world produces more products. If less effort were put to fighting about the division of a small crop of industrial products, and more were put to producing a larger crop, the world would certainly be better off; and each member of the world family would have more goods to consume. Standardization is one way of increasing the crop, and a very effective way, as has been shown wherever it was tried.

Putting Industrial Cripples Back to Work

BY DR. W. GILMAN THOMPSON

Railroad men, both executives and trainmen, are viewing with increasing interest and approval the development of means for the rehabilitation of industrial casualties and treatment of industrial injuries so as to put the man back on his job again with the least possible loss to himself and his industry.

Industrial hazards naturally have been reduced materially by safety devices and compensation laws that make safeguarding of life and limb compulsory. But the volume of non-fatal accidents among employees of railroads is tremendous nevertheless, and will continue to be. Having done nearly all that intelligence can suggest to reduce accident frequency the condition still persists that when an injured man is discharged from a hospital with his wound healed or his fracture mended he is in many cases far from able to work again. In some cases he will never regain use of hand or foot or nervous control sufficient to go back to his trade.

This situation, so serious industrially as well as from the human side, is being met by the Reconstruction Hospital, 100th Street and Central Park West, New York City, in a way that is arousing national interest.

As an example of what industry has to gain from such a hospital and its complete equipment for physiotherapy, there is the case of an employee of the New York Central R.R. who fell and broke both bones in one of his legs. He was treated at a general hospital and the bones set properly. But after four and a half months' treatment he was still wearing the plaster cast, unable to put his foot to the ground. The bones had knit perfectly and there the usual hospital treatment ended. The man went to the Reconstruction Hospital and received a thorough diagnosis by the complete staff of specialists. It was discovered that the trouble was not in the broken bones but in the lost functions of the stiffened joints of ankle and knee. He was given treatment, electrical and massage, and on the re-educational machines in the gymnasium. In ten days he walked; in two weeks he left on foot with his smiling wife; inside of six weeks he was back at work.

An employee of the Ontario & Western R.R. is being treated. He got his hand caught in a machine and it was mangled badly. The general hospital sewed up the cuts, bound his hand and arm to his side and gave him treatment that cured his hand in eight months. They were then through. But the man was left with a crooked, distorted and useless hand, and from long disuse, an arm and shoulder incapable of movement and very painful. He has been receiving re-educational treatment at the Reconstruction Hospital for two months now. His shoulder is limber enough so that he can throw a ball, which in fact is one of his exercises. All but one finger on his hand are under his control again. Without the rehabilitation treatment with its massage, electrical treatment and mechanical exercises on machines peculiarly fitted for the purpose, he might never have regained the use of his hand and his shoulder would have grown worse instead of better.

This sort of treatment, an outgrowth of the reconstruction needs of the armies during the war, demands a special sort of hospital with electro-therapy and hydro-therapy equipment not possessed by many general hospitals, as well as a staff of surgeons and diagnosticians peculiarly fitted for their work. But in the spread of such hospitals lies a new hope for men engaged in hazardous industries and a new opportunity for the industries themselves to bring their trained and trusted employees back again after accidents.

The aim of the directors of the Reconstruction Hospital is to make it an institution upon which other similar hospitals all over the country can be modeled, and to give instruction to students and graduates in the modern science of industrial medicine and surgery as well as training nurses for service in industrial plants.

A Dual Reduction Rear Axle

Interesting Cutting-off, Drilling, Boring and Milling Methods on a Forged Axle—Fixtures Which Facilitate Easy Handling

By FRED H. COLVIN
Editor, AMERICAN MACHINIST

THE making of the dual reduction axle for the Mack truck, involves some interesting machining operations, as will be seen from the following illustrations. These axles are made at the Allentown, Pa., plant of the International Motor Company, this being a new plant and one which is modern in every particular, both as to building and equipment.

The first operation is sawing the forgings to length (70¾ in.) on the two Racine power hacksaws, shown in the foreground of Fig. 1. These hacksaws are located at the proper distance apart so that both ends of the axle can be sawed at the same time with a minimum of attention on the part of the operator. A "Little David" air hoist, mounted on a light overhead traveling crane which serves this and the following operation, makes it easy to handle the forgings from the floor to the cutting off machine and from here to the centering lathe shown in the rear. In both of these operations the axles are located by the spring pads which are forged integral with the axle itself and which are located at an angle with the center opening or banjo if we use the terminology adopted in the shop.

In locating the axle for centering, the banjo rests on the inclined bar *A*, while the spring pads are centered and held at *B* and *C*. The screws *D* and *E* prevent the axle shifting during the centering operation. Centering heads are provided at each end of the machine, these being belt driven and moved to the work by the handle *F*. This is a special machine and the holding fixtures have been so designed as to check the forging dimensions so as to insure cleaning up at all points.

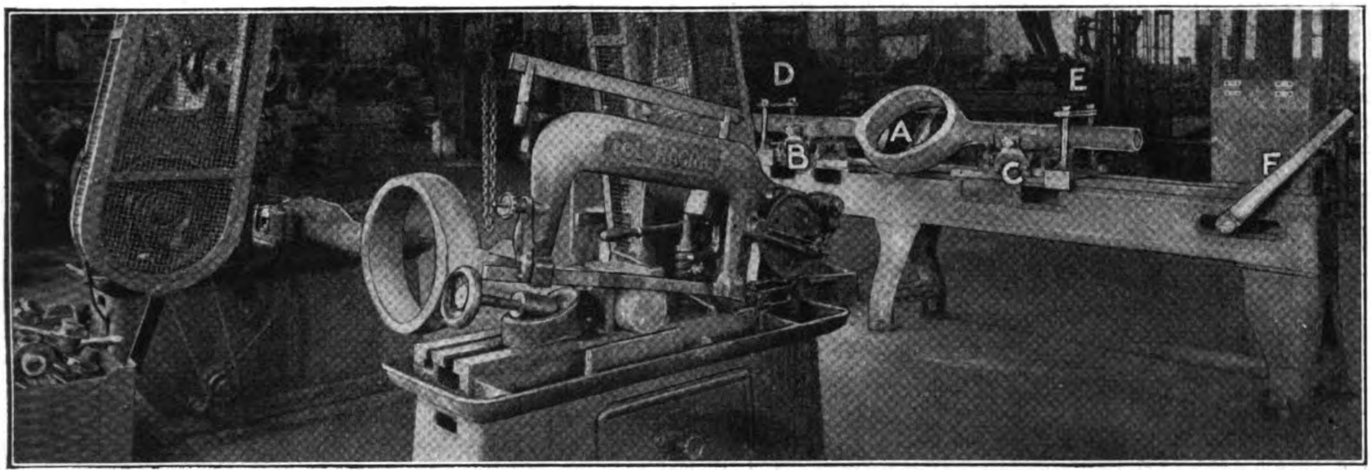
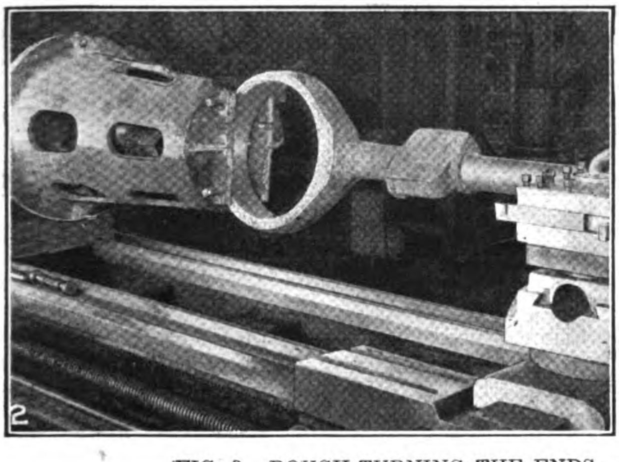


FIG. 1. CUTTING OFF AND CENTERING AXLES



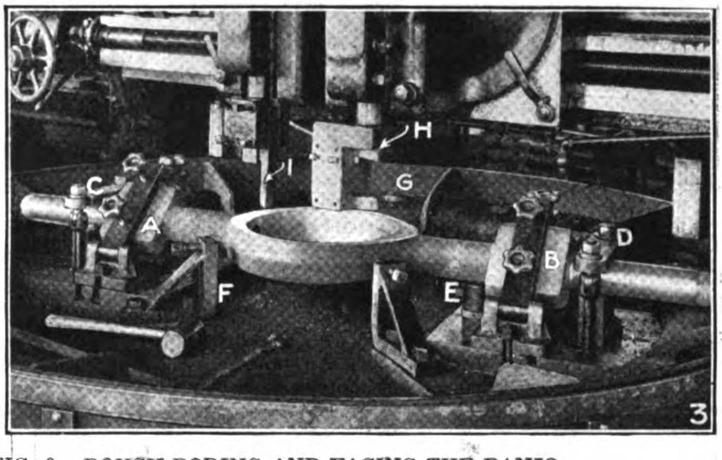
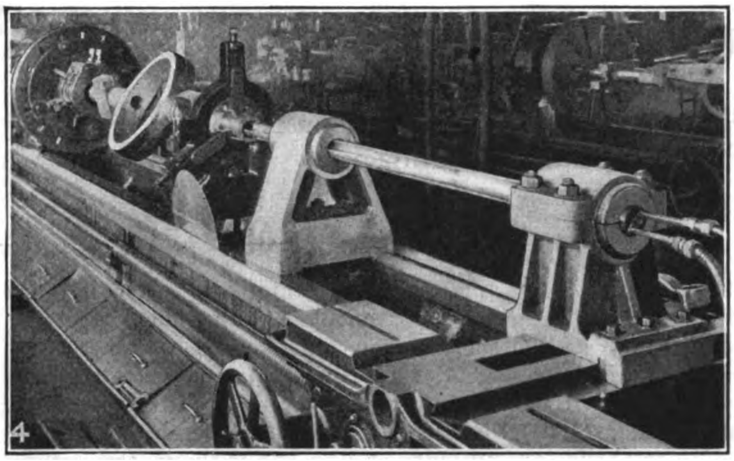


FIG. 2. ROUGH-TURNING THE ENDS. FIG. 3. ROUGH-BORING AND FACING THE BANJO

The axles then go to lathes equipped with special chucks, as shown in Fig. 2, which rough-turn the ends to 3⅛ in. diameter, a tolerance of 0.002 in. being maintained on this operation. This turns the axle between centers and at the same time supports the banjo and utilizes it for driving the axle during the rough-turning.

The rough-boring and facing of the banjo follows, this being performed on a specially equipped Bullard boring mill as shown in Fig. 3. Here again, the axle



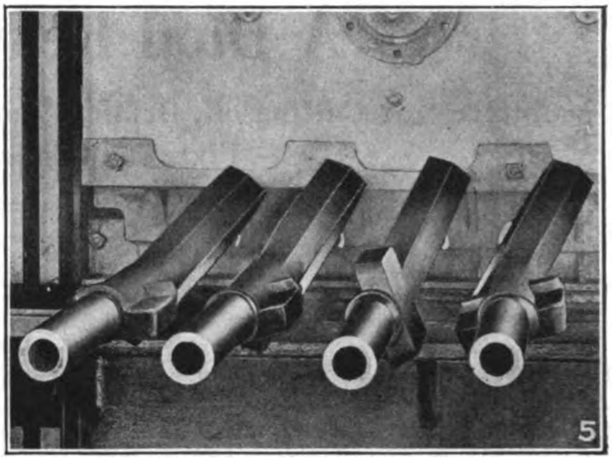
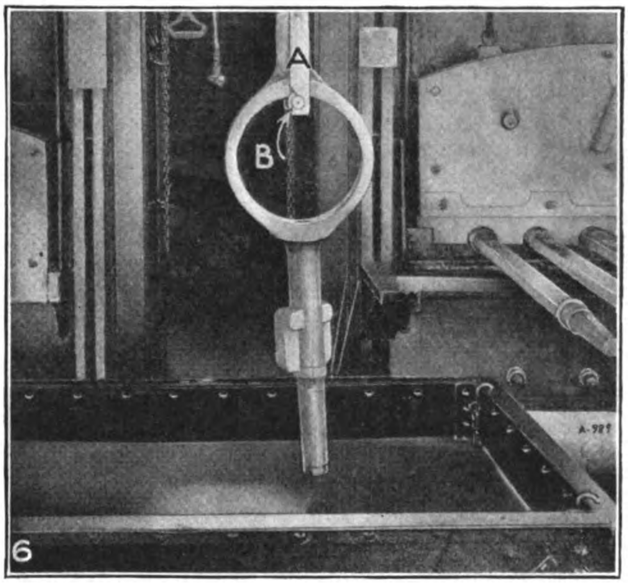


FIG. 4. DRILLING THE ENDS. FIG. 5. HEAT-TREATING THE ENDS

is located by the spring pads which fit into the holding fixtures at *A* and *B*. These locate the pads at the proper angle while clamps *C* and *D* center and hold the axle so that the banjo will be bored and faced square with the two ends. Supporting jacks are provided under each end, one being shown at *E*, while the banjo itself is centered and supported on the outside by four angular clamps as at *F*.

The arrangement of the tools in the two heads can be plainly seen. The tool *G* takes a roughing cut through the hole and after it has reached the proper depth it is fed sideways along the rail so that tools *G* and *H* face both sides at the same time and the correct distance apart. The tool *I* takes a smoothing cut through the bore but the finishing is left to a future operation.

Next comes the boring of a $2\frac{1}{32}$-in, hole for the driving axle, the forging being reversed and the holes drilled



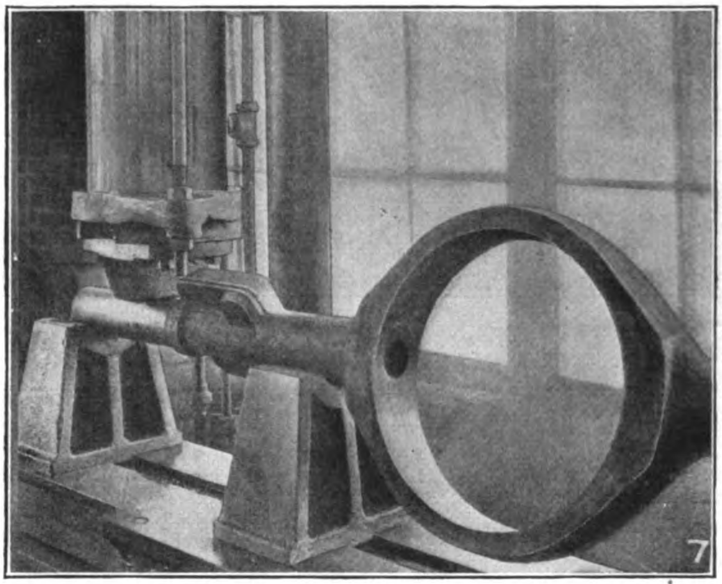
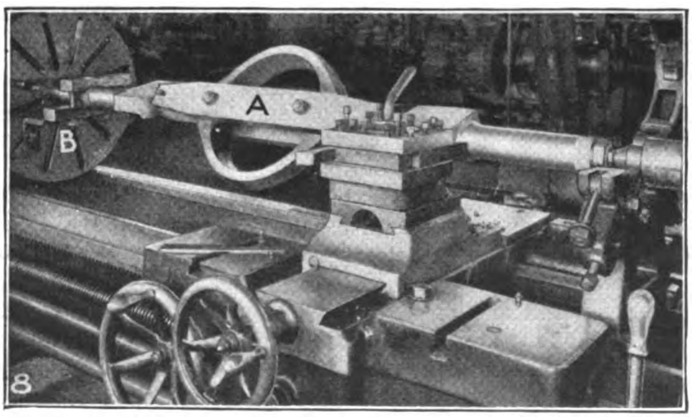


FIG. 6. THE METHOD OF QUENCHING. FIG. 7. STRAIGHTENING AFTER HEAT-TREATMENT



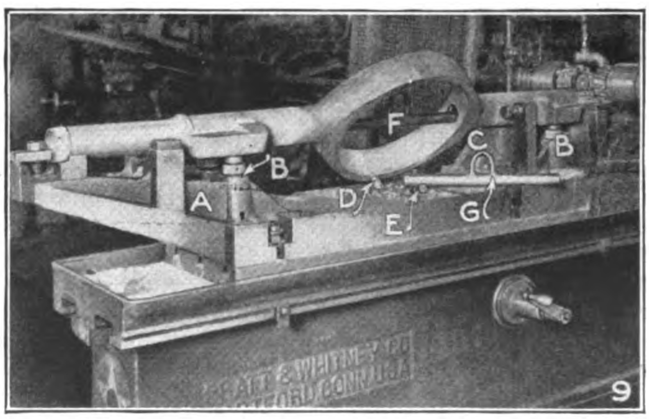


FIG. 8. FINISH-TURNING THE ENDS. FIG. 9. MILLING THE SPRING PAD

from each end. This is done on a standard 22-in. Lodge & Shipley lathe which is specially equipped with the boring bar shown, and uses a heavy oil pressure to remove the chips. A type of gun drill is used which has proved very satisfactory. It will be noted that two cross-slide and crossfeed screws have been removed to make room for the head which carries the boring tool.

Heat-Treating the Axles

The axles then go to the heat-treating department where the ends are heated in the specially equipped furnace shown in Fig. 5. The special door allows the ends of five axles to be heated at once and eventually prevents the heating of the banjo. The axles are then quenched as shown in Fig. 6, this showing the convenient method of supporting them while being dipped by means of the yoke *A* and the removable pin *B*. The axle ends are then reheated and drawn to 270 Brinell harness. Then the axles are tested for straightness and if necessary, straightened in the 150-ton hydraulic press shown in Fig. 7. The form of the bed and the substantial supporting block require no further description.

The ends of the axles are then finish-turned as shown in Fig. 8. Supplementary centers are used and it will also be noted that a special supporting clamp *A* covers the banjo and reaches to the spring pad. The two sides of the clamps are held together by through bolts in the banjo hole. The setscrews at the end aid in stiffening the whole piece and effectually preventing its springing during the turning operation. The clamp for driving is shown at *B*.

Milling the Spring Pads

A special fixture is provided for milling the spring pads, as shown in Fig. 9, this operation being performed on a Pratt & Whitney duplex milling machine. The turned portions of the axle are supported at the ends, as at *A* and easily operated screw jacks *B* come up under the spring pad and take the downward thrust of the milling cutter. The pad is located endwise by the screw stop *C*. Stops *D* and *E* locate the angle of the banjo.

The method of handling these axles by the overhead air hoist is interesting, both from the viewpoint of con-

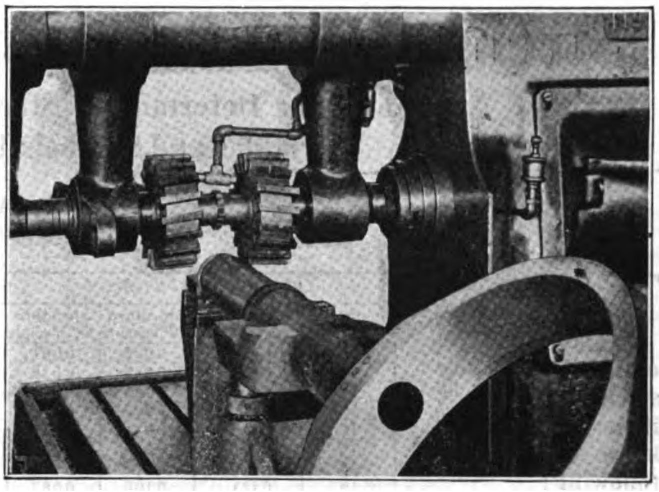


FIG. 10. MILLING THE KEYWAYS

venience and facing. The lifter *E* with its projecting pins, can easily be slid into place and used in lifting the load, the pins effectually prevent any side slipping. The lifting bar can remain in the axle during the operation or can be removed at will. Another lifting bar is shown at *G* simply to show just exactly how it is made.

A similar fixture is also used on the No. 5 Cincinnati machine shown in Fig. 10, which is used in milling the keyways for the stop collar at the end of the axle. The large milling cutters can also be used in machining the spring pads as supplementing the other machine.

The four bolt holes are next drilled through the rim of the banjo by means of the portable fixtures shown in Fig. 11. This positions the holes lengthwise with reference to the axle shoulders and centers them by the axle ends themselves. Quick-acting clamps fasten the drilling fixture firmly in position, under the American radial drilling machine shown.

The last machining operation is shown in Fig. 12, where the spring bolt holes are being drilled through the spring pads. Here the holes are located from those previously drilled and tapped in the rim of the banjo, by the plugs *A* and *B*. Screw jacks support the spring pads so as to allow a heavy feed to be taken in the drilling operation. Then come the boring and final inspection, after which the axles are ready for assembly.

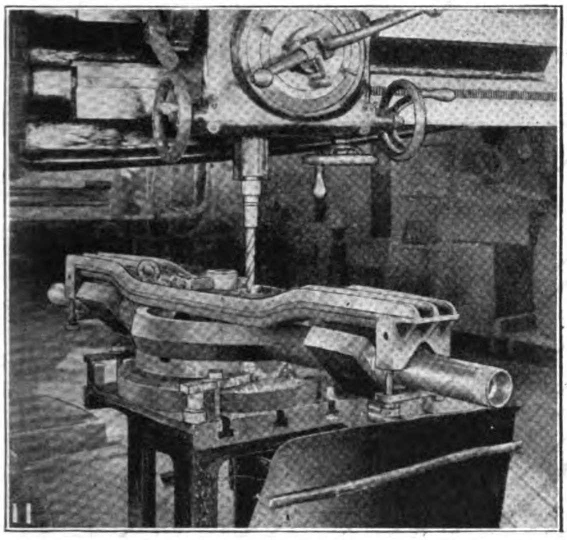


FIG. 11. DRILLING AND TAPPING BANJO HOLES.

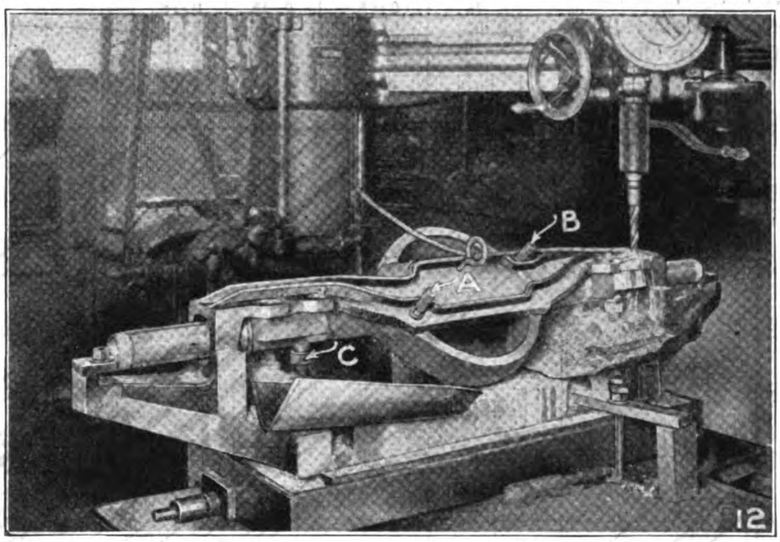


FIG. 12. DRILLING PADS FOR SPRING BOLTS

Strength and Proportion of Industrial Gears

Charts for Determining Strength of Industrial Gears—The Formulas and Symbols Used—Practical Examples

By G. E. KATZENMEYER
R. D. Nuttall Co

To determine the proper size and to calculate the strength of gears, it is necessary to know one of the following:

(a) Horsepower of drive and r.p.m. of shafts or velocity and diameter of gears. (b) Kilowatts consumed and r.p.m. of shafts or velocity and diameter of gears. (c) Torque in shafts in inch lb. and r.p.m.

STRENGTH FACTOR—Y			
Number of Teeth	R.D.N. 20° Involute Stub	Standard 20° Involute	Standard 14½° Involute
12	0.099	0.078	0.067
13	0.103	0.083	0.070
14	0.108	0.088	0.072
15	0.111	0.092	0.075
16	0.115	0.094	0.077
17	0.117	0.096	0.080
18	0.120	0.098	0.083
19	0.123	0.100	0.087
20	0.125	0.102	0.090
21	0.127	0.104	0.092
23	0.130	0.106	0.094
25	0.133	0.108	0.097
27	0.136	0.111	0.100
30	0.139	0.114	0.102
34	0.142	0.118	0.104
38	0.145	0.122	0.107
43	0.148	0.126	0.110
50	0.151	0.130	0.112
60	0.154	0.134	0.114
75	0.158	0.138	0.116
100	0.161	0.142	0.118
150	0.165	0.146	0.120
300	0.170	0.150	0.122
Rack	0.175	0.154	0.124

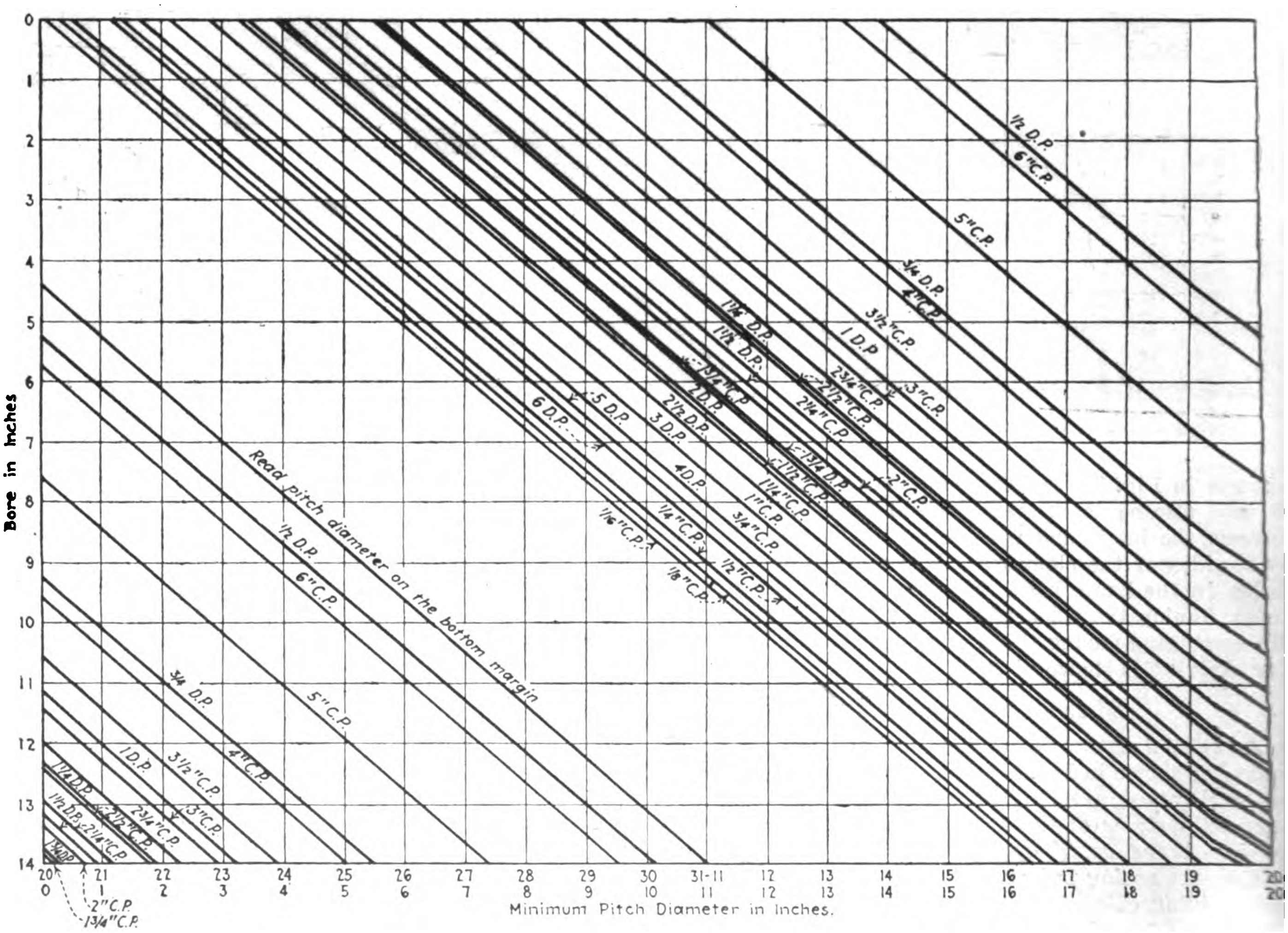
(d) Load or weight lifted, the diameter of drum, the velocity of the lift and r.p.m. of driving member (for hoists).

(e) Diameter of shaft and r.p.m.

In addition to one of the above the working condition and service should be taken into consideration.

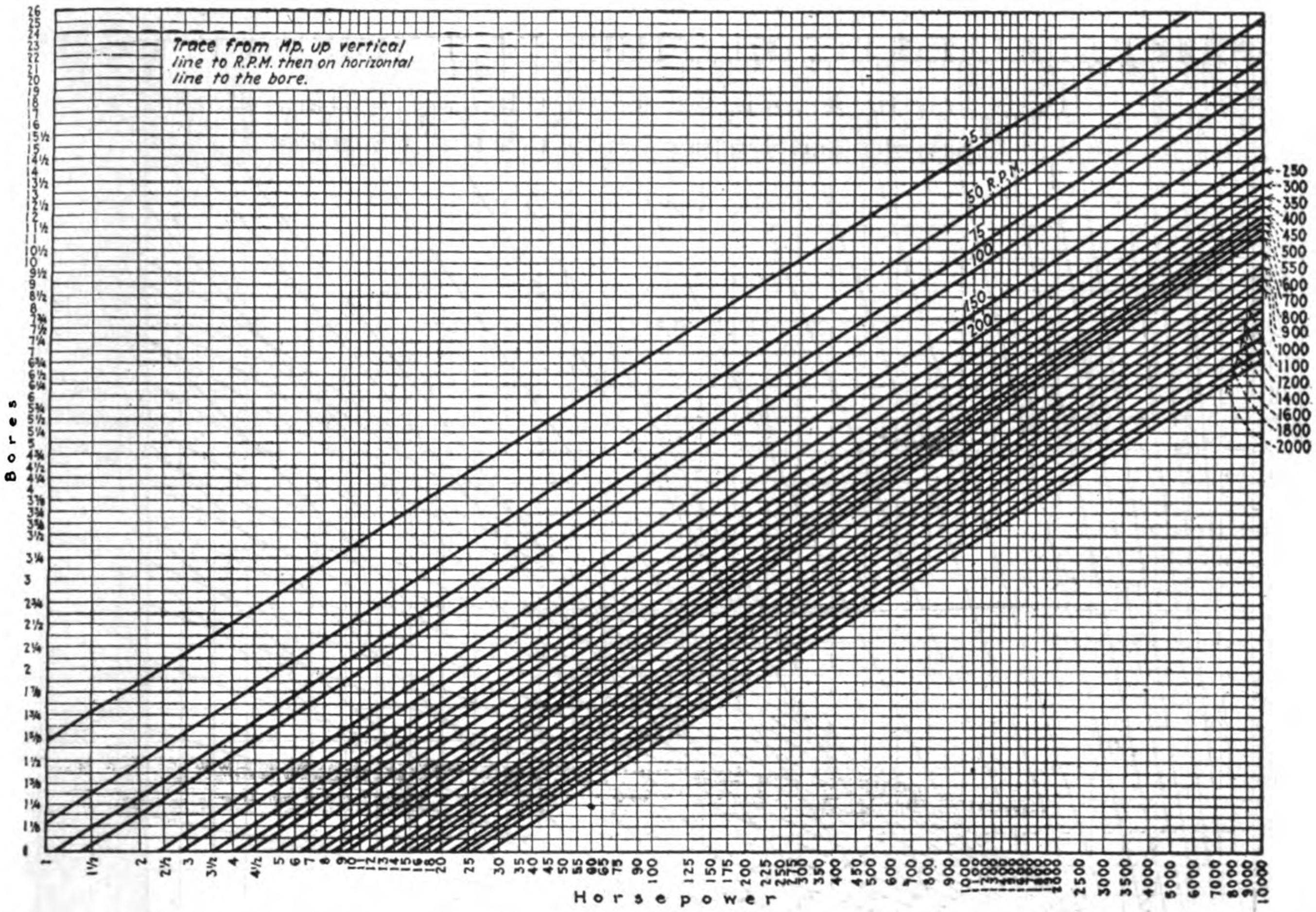
These symbols will be used in the equations which follow:

- *hp.* = Horsepower.
- *W* = Load at pitch line.
- *V* = Velocity in feet per minute.
- *kw.* = Kilowatts.
- *r.p.m.* = Revolutions per minute.
- *Te* = Traction effect at car wheel.
- *M* = Miles per hour.
- *R* = Ratio of gear to car wheel.
- *S* = Working Stress of material from chart No. 4.



Minimum pitch diameter given bores with standard keyway, untreated material. For heat treated pinions and gears make the minimum thickness between root diameter and (bore = [illegible] / D.P.), keyway or counterbore equal to [illegible] / D.P. From bore trace along horizontal line to pitch then on vertical line to minimum pitch diameter.

TABLE (ABOVE). STRENGTH FACTORS FOR LEWIS FORMULA. FIG. 2 (BELOW). CHART FOR MINIMUM PITCH DIAMETERS



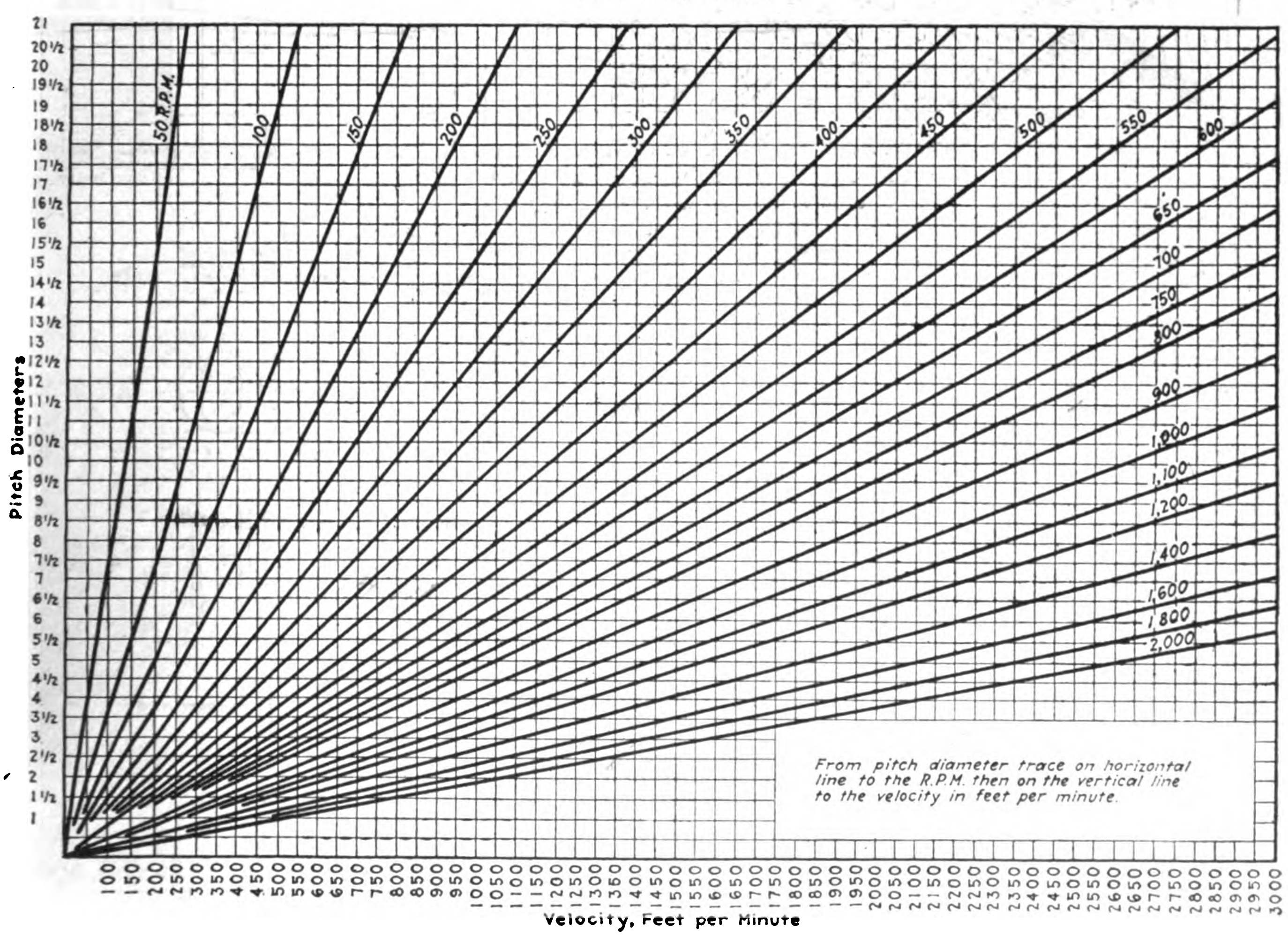


FIG. 1 (ABOVE). CHART FOR OBTAINING BORES. FIG. 3 (BELOW). CHART FOR VELOCITIES

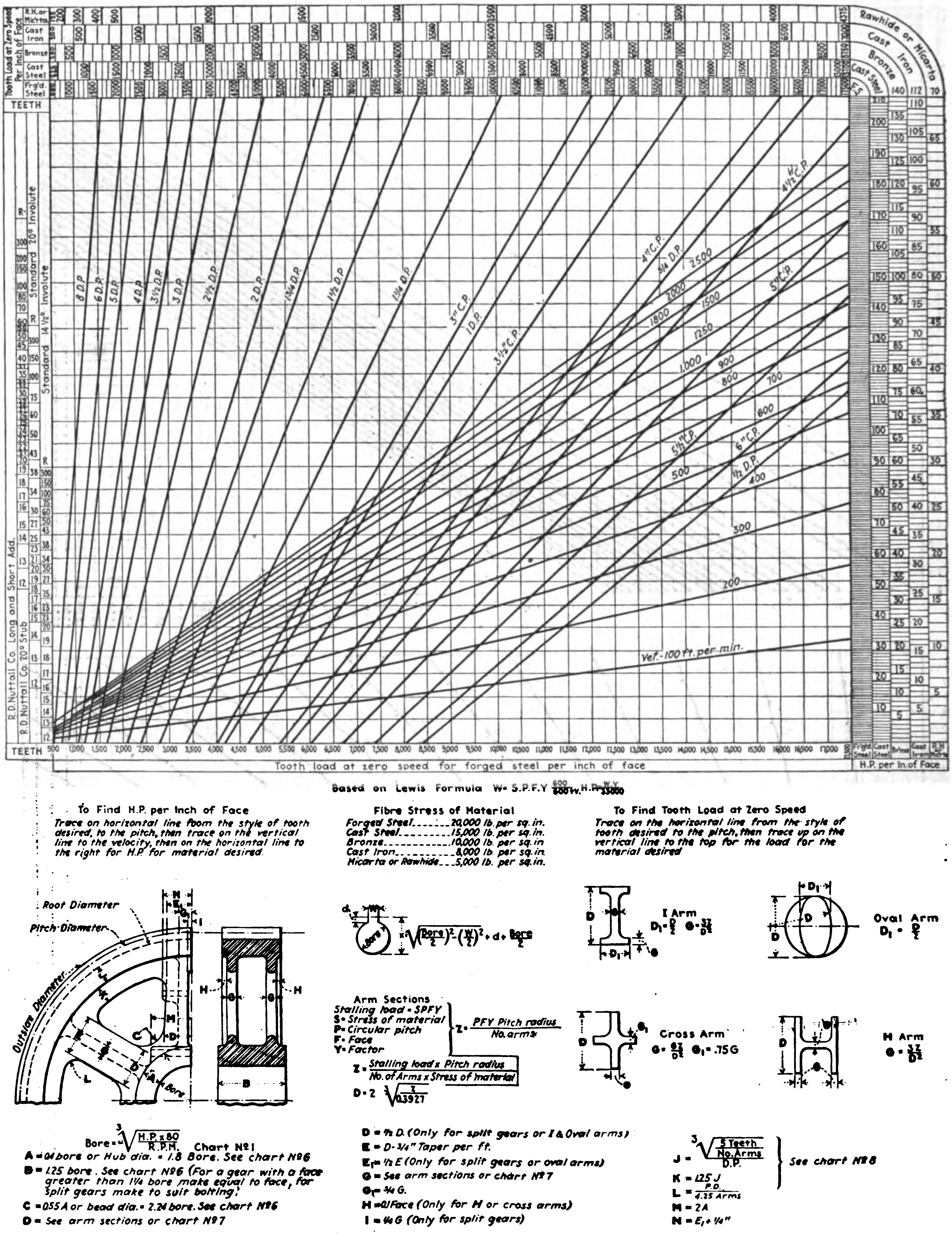


FIG. 4. CHART FOR DETERMINING HORSEPOWER AND STANDARD GEAR PARTS

P = Circular Pitch.
$D.P.$ = Diametral Pitch.
F = Face of gear.
Y = Tooth Factor from table No. 1.
$P.D.$ = Pitch Diameter.
T = Torque of Shaft in inch-pounds.

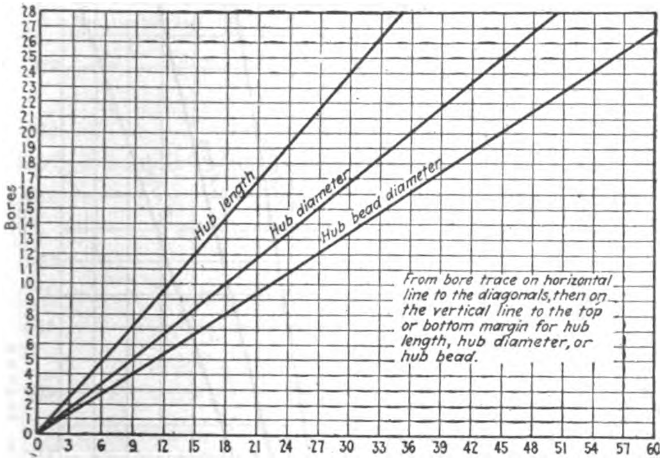


FIG. 5. HUB DIAMETER, LENGTH AND BEAD

D = Diameter of shaft or bore of gear.

$$hp. = \frac{WV}{33{,}000} = \frac{TeM}{0.375} = \frac{T \times r.p.m.}{63{,}025} =$$

$$0.746\ kw. = \frac{D^3 \times r.p.m.}{80}$$

$$T = \frac{63{,}025 \times hp.}{r.p.m.}$$

$$kw. = 1.34\ hp.$$

$$W = \frac{hp. \times 33{,}000}{V} = \frac{kw. \times 44{,}102}{V}$$

$$\frac{63{,}025 \times hp.}{r.p.m. \times \text{PITCH Rad.}} = SPFY \left[\frac{600}{600 + V}\right]$$

$$Te = \frac{W}{R} =$$

$$\frac{\text{Teeth in gear} \times 24 \times \text{Gear Efficiency} \times \text{Torque of Motor}}{M \times \text{dia. of car wheel}}$$

$$V = P.D. \times 0.262 \times r.p.m.;$$

$$P.D. = \frac{V}{0.262\ r.p.m.};\quad r.p.m. = \frac{V}{0.262\ P.D.}$$

$$D = \sqrt[3]{\frac{hp. \times 80}{r.p.m.}}$$

Face of Spurs = 3 to 4 times circular pitch.
Minimum face of Helicals = 4 times circular pitch.
Minimum face of Herringbone = 6 times circular pitch.

To reduce the work involved to calculate a set of gears use the charts in the following order:

To Find Horsepower of Pinion

Chart No. 1 for bore.

Chart No. 2 for minimum pitch diameter of pinion for a certain pitch.

Chart No. 3 for velocity.

Chart No. 4 for horsepower.

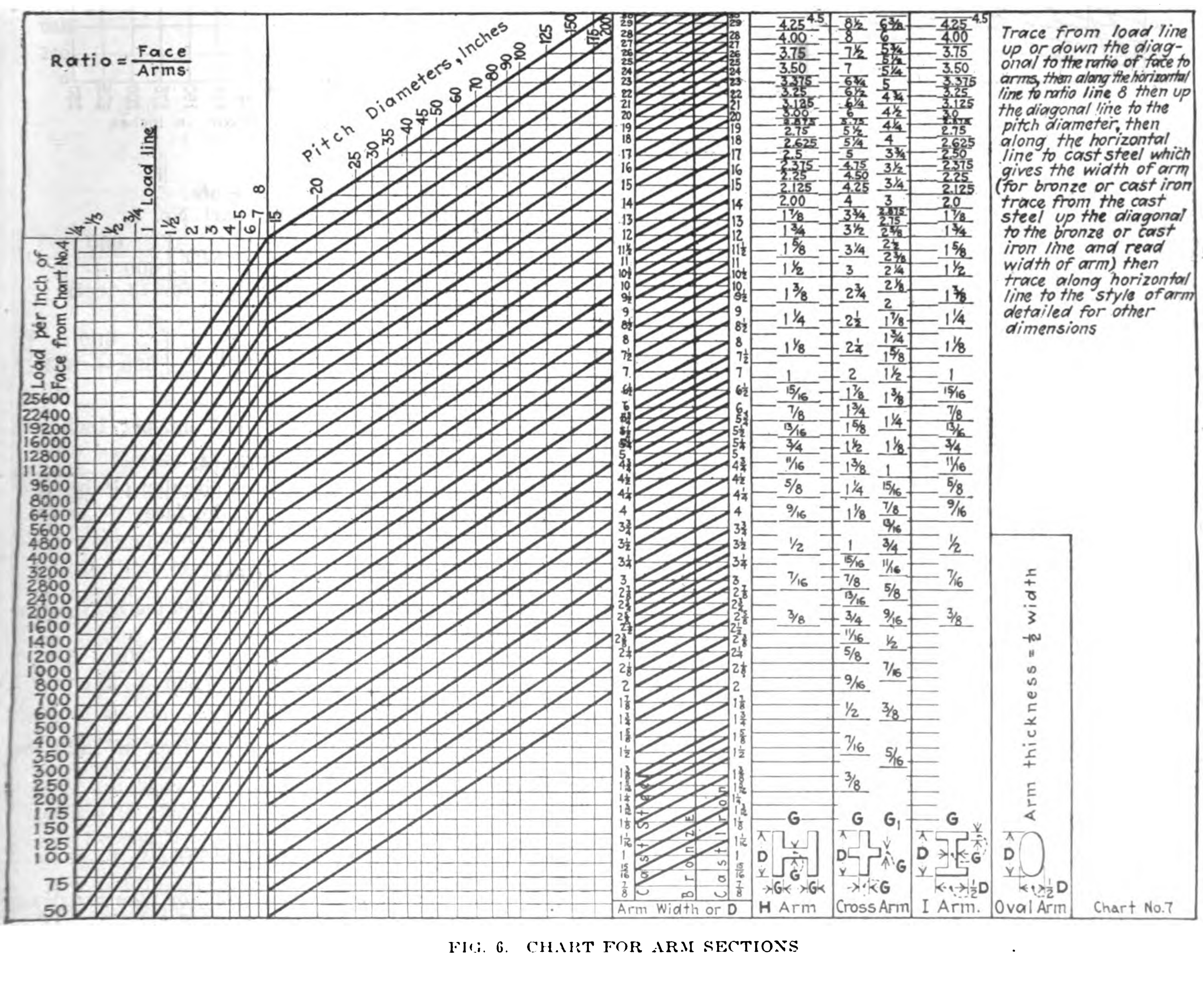


FIG. 6. CHART FOR ARM SECTIONS

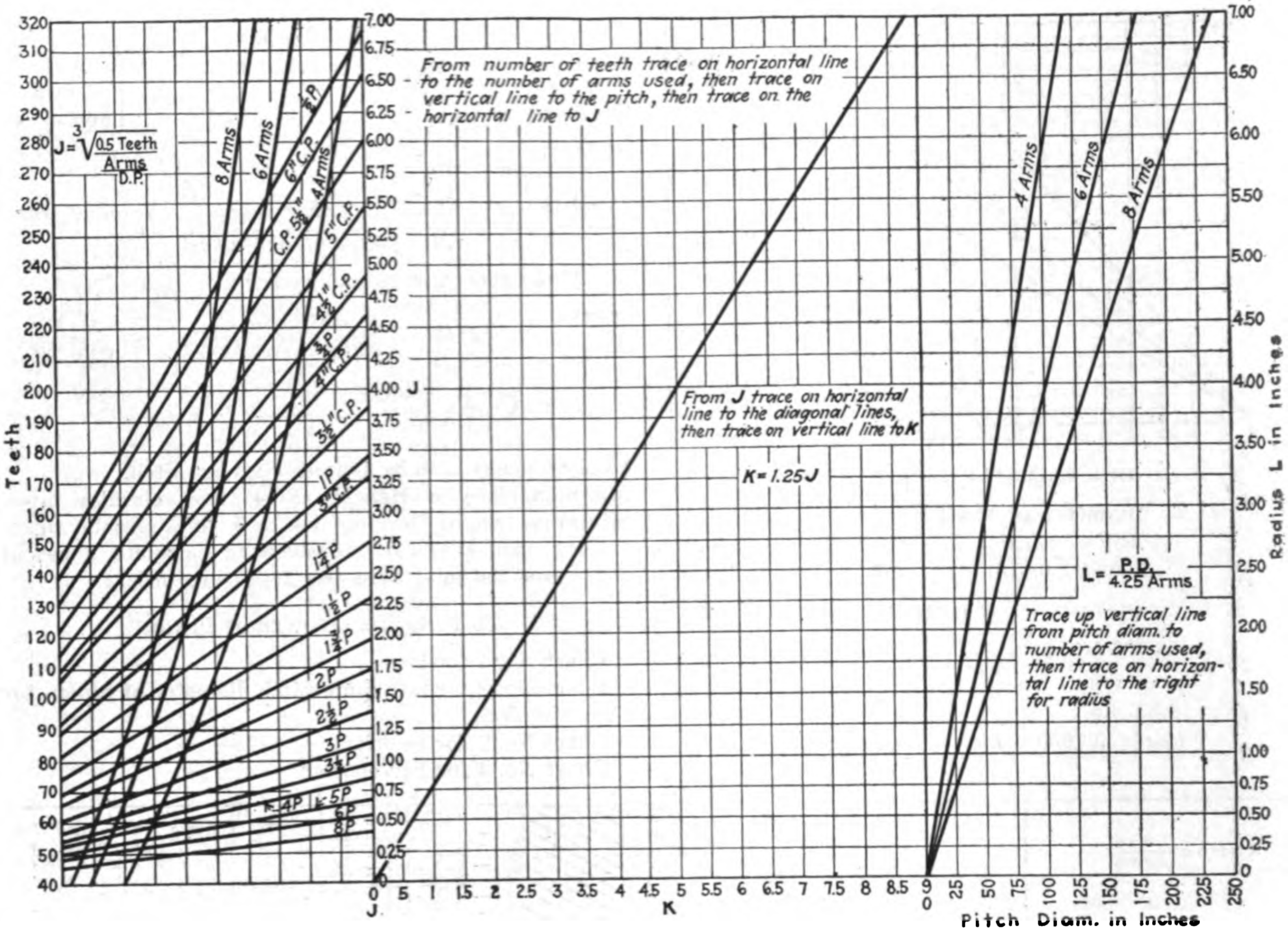


FIG. 7. RIM THICKNESS, RIM BEAD AND FILLET

To Find Horsepower of Gear

Teeth in gear = teeth in pinion × ratio of reduction desired.

Velocity same as for pinion.

Chart No. 4 for horsepower.

To Design Gear Refer to Chart No. 4

Chart No. 1 for bore.

Chart No. 5 for hub diameter, hub length and hub bead.

Chart No. 6 for arm section.

Chart No. 7 for rim thickness, rim bead and radius connecting bead and arm.

Example:

Wanted a pair of spur gears to transmit 30 hp., the driving shaft to run at 1,000 r.p.m. and driven shaft at 100 r.p.m. Pinion to be forged steel and gear cast steel 14½ deg. involute.

Horsepower of Pinion

$$\text{Bore} = \sqrt[3]{\frac{hp. \times 80}{r.p.m.}} = \sqrt[3]{\frac{30 \times 80}{1{,}000}} =$$

1.34 in. say 1$\frac{3}{8}$ in. or take reading from chart No. 1.

For approximate pitch diameter of pinion consult chart No. 2.

From 1$\frac{3}{8}$-in. bore trace to the 4-pitch line and read 3¼-in. pitch diameter.

3¼-in. pitch diameter × 4-pitch = 13 teeth.

$V = P.D. \times 0.262 \times r.p.m. = 3\frac{1}{4}\text{ in.} \times 0.262 \times 1{,}000 = 851$ ft. per minute.

or take reading from chart No. 3.

$$WF = \text{load per inch of face} = SPY\left[\frac{600}{600 + V}\right];$$

4 $D.P.$ = 0.7854 in. P; Y for 13 teeth = 0.70.

$$WF = 20{,}000 \times 0.7854\text{ in.} \times 0.070 \times \left[\frac{600}{600 + 851}\right] = 454\text{ lb.}$$

$$hp. = \frac{WFV}{33{,}000} = \frac{454 \times 851}{33{,}000} = 11.7\text{ hp. per inch of}$$

face or take reading from chart No. 4.

Face of spur = 3 or 4 times circular pitch.

0.7854 in. × 3½ in. = 2¾ in. face

11.7 hp. × 2¾ in. = 32.17 hp.

Horsepower of Gear

13 teeth in pinion × ratio 10 to 1 = 130 teeth in gear

Y for 130 teeth = 0.119.

$$WF = 15{,}000 \times 0.7854 \times 0.119\left[\frac{600}{600 + 851}\right] = 579\text{ lb.}$$

$$hp. = \frac{579 \times 851}{33{,}000} = 14.94\text{ hp. per inch of face or}$$

take reading from chart No. 4

14.94 hp. × 2.75 in. = 41 hp.

Design of Gear, Refer to Chart No. 4

$$\text{Bore} = \sqrt[3]{\frac{30 \times 80}{100}} = 2.9,\text{ say 3 in., or take reading}$$

from chart No. 1.

Hub diameter = bore $\times$ 1.8 = 3 in. $\times$ 1.8 = 5.4 in., say $5\frac{3}{8}$ in., or take reading from chart No. 5.

Hub length = bore $\times$ $1\frac{1}{4}$ = 3 $\times$ $1\frac{1}{4}$ in. = $3\frac{3}{4}$ in., or take reading from chart No. 5.

Hub bead diameter = bore $\times$ 2.24 = 3 $\times$ 2.24 in., = 6.72 in. say $6\frac{3}{4}$ in. or take reading from chart No. 5.

D = arm width; D_1 = arm thickness; $P.D. = \frac{130}{4} =$ 32.5 in.

$$Z = \frac{PFY \text{ pitch rad}}{\text{No. of arms}} =$$

$$\frac{0.7854 \text{ in.} \times 2.75 \times 0.119 \times 16.25 \text{ in}}{6} = 0.695 \text{ in.}$$

$$D = 2\sqrt[3]{\frac{Z}{0.3927}} = 2\sqrt[3]{\frac{0.695 \text{ in.}}{0.3927}} =$$

$$2\sqrt[3]{1.77} = 2 \times 1.21 \text{ in.} = 2.42 \text{ in. say } 2\tfrac{1}{2} \text{ in.}$$

$D_1 = \frac{1}{2} D = 1\frac{1}{4}$ in., or consult chart No. 4 for load of 130 teeth, 4 P, $14\frac{1}{2}$ involute and read, 1,700 lb. Then from chart No. 6 take reading of oval arm section of $2\frac{1}{2}$ in. for D and $\frac{1}{2} D = 1\frac{1}{2}$ in. for D_1,

$E = D - \frac{3}{4}$ in. per foot $\times$ length of arm from hub diameter to rim

$$= D - \left(\frac{\text{Rim dia.} - \text{Hub dia.} \times \frac{3}{4} \text{ in. per foot}}{2}\right)$$

$$= 2\tfrac{1}{2} \text{ in.} - \left(\frac{30\frac{7}{8} \text{ in.} - 5\frac{3}{8} \text{ in.} \times \frac{3}{4}}{2 \times 12}\right) =$$

$$2.50 - 0.80 = 1.70 \text{ in. or } 1\tfrac{3}{4} \text{ in.}$$

$$E_1 = \frac{1.75 \text{ in.}}{2} = \tfrac{7}{8} \text{ in.}$$

$$J = \frac{\sqrt[3]{\frac{0.5 \text{ teeth}}{\text{arms}}}}{D.P.} = \frac{\sqrt[3]{\frac{0.5 \times 130}{6}}}{4} = 0.55 \text{ in., or take}$$

reading from chart No. 7.

$K = 1\frac{1}{4} J = 1\frac{1}{4} \times 0.55$ in. = 0.6875 in., or take reading from chart No. 7.

$$L = \frac{P.D.}{4\frac{1}{4} \text{ arms}} = \frac{32.5 \text{ in.}}{4\frac{1}{4} \times 6} = 1.27 \text{ in., say } 1\tfrac{1}{4} \text{ in., or take}$$

reading from chart No. 7.

Elimination of Unnecessary Lines

The Fabricated Production Department of the Chamber of Commerce of the United States gives the following example of what can be accomplished in the elimination of unnecessary lines. A manufacturer of pipe and fittings tells the story of what was accomplished in his plant on standardization of product. His experience should prove of value to other branches of industry.

"The manner in which this problem of excess variety came to our attention was through the fact that, although we had large inventories in the aggregate, we also had huge shortages in many lines. Evidently, we had considerable dead stock on our hands. We were unable to give our customers the best service. We had large sums frozen in slowly moving merchandise inventories and were, consequently, losing profits.

"We catalogued some 17,000 different items of our own manufacture, but a most casual glance through our stores records indicated that there were hundreds, if not thousands, of these items in the slowly moving class. We decided, therefore, to determine which were the 500 fastest moving or most significant items. In order to do this, we tabulated by pieces and by weight our yearly sales, in terms of orders received at the factories, for a period of five years, and determined the yearly averages over this period. We found it expedient to expand our list so as to include 610 items.

"What did this simple analysis reveal? It showed us, much to our surprise that between 60 and 65 per cent of our tonnage output is represented by these 610 items. The answer was obvious. Thousands of the other items are, no doubt, very essential to the community, but there are also thousands of the other items for which standard material can be substituted. Our thought is to increase the size of our list of fast moving items, so as to embrace all items which we would stock. All other material would be considered as special and made on order only.

"By co-ordinating our production with the demand for these important items so as to always have them in stock, we hope to persuade the trade to take the standard material, and receive immediate delivery, rather than to wait for a somewhat modified pattern. The co-ordination of our sales and production is the extremely important consideration, as this will enable us always to supply our customers; it will allow us to maintain our inventories at the minimum, giving us a maximum turnover, and tying up a minimum of investment in merchandise."

Orders and Acknowledgments

By L. G. Stebbins

Nearly every purchasing agent has some method or system of insuring the prompt acknowledgment of orders. This is a very important part of the purchasing agent's work, as from a legal standpoint it is desirable, and in many cases necessary, to obtain a written acknowledgment of an order, so that evidence of a complete contract may exist if a suit at law becomes necessary. A simple system for handling this matter is described in the following paragraphs.

A carbon copy of each order is made out and kept on the desk of the purchasing agent, or his assistant. These copies are referred to daily, properly marked with the date acknowledgment is received and the carbon copy filed alphabetically to await receipt of the goods.

If no acknowledgment or invoice is received after a reasonable length of time, a short letter is written to the concern with which the order was placed, asking for an acknowledgment of the order. There should, however, be close co-operation between the various departments so that a letter will not be sent out asking for an acknowledgment when an invoice for the goods has already been received. Some large concerns have printed forms asking for acknowledgments; these are sent out with orders.

It is better to write an original letter asking for acknowledgment, when necessary, rather than to send out a printed form which is not likely to get prompt attention.

The acknowledgments as received are kept in a special desk file, and when the goods have been received and the transaction closed, the acknowledgments are destroyed.

Machine Tool Builders Hold Spring Meeting

Optimistic Gathering Devotes Itself Strictly to Business—New Constitution Adopted After Careful Consideration—Joint Standards Committee Gets Under Way

THE most noticeable feature of the semi-annual meeting of the National Machine Tool Builders Association was the general air of optimism and confidence in the future that was evident on all sides. Compared to the deep blue tinge of the previous meeting in New York and the gloom of a year ago the change was pronounced.

The convention was held at the Hotel Traymore in Atlantic City and was not so well attended as usual, which is not surprising in view of the depth of the depression through which the industry has been passing. No outside speakers were present and only one open session was held, on Tuesday morning, April 25, at which the reports of the officers were presented. In the afternoon an executive session went over the new constitution, as presented by O. B. Iles of the International Machine Tool Co., article by article, and adopted it almost without question.

Wednesday was devoted to meetings of the members of the different group committees and the convention broke up on Thursday.

Important Meeting on Standardization

Probably the most important action taken at the convention, aside from the adoption of the new constitution, was the standardization meeting. General Manager DuBrul and eight or ten of the members met with a committee of the American Society of Mechanical Engineers to formulate plans of organization for a joint committee on the standardization of machine tool elements to sponsor standards of this sort under the American Engineering Standards Committee. C. B. LePage, assistant Secretary of the A. S. M. E. in charge of standards work, was present and told of the methods of establishing standards under the direction of the A. E. S. C. The members of the committee present were H. E. Harris of the H. E. Harris Engineering Co. of Bridgeport, Conn., E. R. Norris of the Westinghouse Electric & Manufacturing Co., F. H. Colvin of American Machinist and F. O. Hoagland of the Reed-Prentice Machine Tool Company.

It was finally decided to appoint a kind of steering committee to be composed of the five members from the A. S. M. E. representing engineers and users of machine tools, and five members of the National Machine Tool Builders Association to represent the producers, one for machines using revolving tools, one for machines where the work revolves, one for machines with reciprocating tools such as planers and shapers, one for grinding machines and one for presses and forging machines. The actual work of investigating and recommending standards will be done by subcommittees of the different groups of machine tool builders sitting with representatives of the users and engineers. Their findings will be cleared through the main committee.

It is a matter for congratulation that steps have finally been taken to start the work of standardization in the machine tool industry, so much needed for many years. Present plans call for consideration of very few elements at the beginning, dimensions of T-slots being the first on the list. The progress of the work will be closely followed by American Machinist as a development which has long been advocated editorially.

High Spots in President Tuechter's Address

Some of the salient points in President A. H. Tuechter's address follow:

As I look back on the last eighteen months, it saddens me to think of what the machine tool business has gone through, and of the unnecessary, avoidable losses it has suffered. For, as I look about, I see other industries that are much better off because they were ready for the slump—good association work warned them of what was coming. How much loss our industry could have been saved if, before 1920, we had developed the constructive service, such as we have been developing by the last sixteen months' work!

The Bible tells us that "He who perseveres to the end shall be saved." Surely those lacking in perseverance are out of place in the machine tool business. From the high peak of war in 1917 or 1918, machine tool demand has dropped to the worst condition any of us have ever seen, and probably relatively the worst the industry has ever known. But are we down-hearted? No! Emphatically no! Serious, we are, of course; who wouldn't be serious in times like this, with orders dragging bottom for nearly two years past? The slow recovery of the world from its war debauch affords good reasons for us to take a serious view of life just now. But are we supine? Crushed? Far from it. Every well run shop in the industry has been overhauled; its equipment is put in tip-top shape, ready to go when the world gives the word. The drafting room of every well run shop is busy on improvements. When the world again needs new machine tools, we will be there with tools so good that the world will have to throw its old ones on the scrap heap. Preseverance and courage have always marked this industry in every depression, and they mark it now, as always before.

Value of Better Statistics

Many of us must make machines in advance of demand, and have them ready when the demand comes on us. Through lack of definite information on machine tool demand, some of us over-estimated our demand and thereby caused ourselves large losses. We had no lookout to warn us of the dead calm into which we were heading and in which we have been wallowing for months.

Some members now feel that the calm will be so dead for months or years to come that we don't need a lookout. All signs are now against that short-sighted attitude. Mr. DuBrul has pointed out that in times past, before we got orders, the world had to save up funds to buy machinery, and only after those funds were at hand, did our orders come on. Watching the situation as to available capital will enable us to forecast the right time and the wrong time to lay in the stocks we need. If our various groups will only help to make our statistics more complete, we need not repeat our old mistakes. Without them we will still have only rumors and hunches by which to guide ourselves. On the revival we might easily wait too long before starting up our idle shops. When demand again becomes strong enough to support us, we do not want to find our stockrooms bare, when we should have stocks on hand. We do not want to find ourselves trying to reorganize our forces after the labor market has been swept clean. A strong demand could easily creep upon us unawares, just as our overstocking came about, unless we have an observer who can read the business weather signs that indicate the return of demand.

If Europe settles down to work instead of waste, the endless wants of the world may create demand faster than we now think. We surely do not wish to be caught napping again, and we need not be, with a wide-awake lookout to give us warning that the wind is freshening off in the distance. This industry certainly needs someone whose duty it is to note the shadows that coming events may be

casting, unobserved by the busy executive who has many things to do. This industry needs the best service of this sort that it is possible to get, because we have so many complicated problems to solve, particularly in this excessive depression. I am convinced that we have just the sort of lookout we need.

The industry should not falter in the work it has started, and by which it can again put itself in a healthy condition.

Today we have progressed far, but much more remains to be done. Standardization and statistics are the two big things ahead of us. Statistical reports have been valuable to a few groups who have started them. They become more valuable as time goes on. We ought to make our statistical work cover every branch of the industry. That work repays active co-operation of the members in each group. As more groups join in, we can construct that reliable, trustworthy barometer that our manager has been so anxious to give us.

The wide variety in outlet, size and cost of the various machines made by our members, makes it possible for us to get a more reliable forecast than almost any other. Piecing our own information with that of other industries is the job that must go along with the betterment of our own statistics.

Demand for heavy machinery is preceded by abundance of long time investment funds, which is gaged by bond yields. Demand for light machinery is preceded by abundance of short time funds, gaged by commercial paper rates. Dr. Whaling, of Cincinnati, predicts the demand for iron and steel for some producers several months ahead with uncanny accuracy. We are learning how demand for our various types of machines tie in with iron and steel. If a few representative concerns will give our manager the figures on the past, as to orders and shipments, he can work out the past, and from that we can make better estimates on the future. Then, we will be able to tell better how to steer our businesses. Nothing but good can result from that sort of work. It is worth far more than the little trouble it takes to dig back into old records to work this out. Let us dig out our old mistakes and let our newer knowledge help us to avoid repeating them.

Importance of Standardization

Our industry has been backward in standardization, but we are now able to report definite progress. The American Engineering Standards Committee has invited us to accept joint sponsorship with the American Society of Mechanical Engineers on the project of standardization of small tools and machine tool elements.

The first project to be considered is T-slots. This element is common to all machine tools, but when gone into, is found to have some decidedly important features.

It must be confessed that the machine tool industry has no definite standards that have been duly accepted and promulgated as such.

Our customers are demanding standardization. Only recently, a builder of a certain type of machines was requested to make a certain minor change in his machine that only involved boring a hole to one dimension, rather than the dimension used by the builder. The user had over $5,000 worth of equipment which he was using on a machine of another make, which would have been useless unless the hole were bored to the proper dimensions on the machine he was then buying. Standardization of one hole saved $5,000 to that customer.

In England, the Machine Tool Builders Association has arrived at a standard for milling machine spindles, so that in the future, every milling machine build in England will be able to use the same face mills, arbors, etc., that are used on every other English milling machine. It is understood that the English standard is based on some American practice.

If men think that there is not much to standardize, let them think only of those two instances and they will surely recognize that we are lax in our attitude, if we do not actively engage in this sort of work. Not only will we be lax in our attitude, but we shall lose money by losing orders, unless we enter into it.

Report of General Manager DuBrul

The world has been going through the worst depression it has ever known. The machine tool industry, that in its very nature must have deeper depressions than other industries, has not been able to escape the general conditions.

An association, to be successful, must essentially be an information bureau. Valuable information about any industry can only be gathered from the members of the industry. Much of th^t information lies useless simply because it is scattered and not co-ordinated. Gathered together in one place and pieced together in a systematic, co-ordinated whole, each fragment of information becomes more valuable to the man who contributed it than it was by itself in his sole possession.

To gather and co-ordinate information requires two things: the first being the spirit of co-operation. Industries that have developed this spirit to the greatest extent have made the greatest progress as industries; and the individual firms who are the best co-operators eventually make the greatest individual progress in these progressive industries. The second requirement is money to support the co-operative work. Industries that spend money freely but judiciously on their associations get the most information per dollar spent.

Information Worthless If Not Used

But merely collecting this valuable information is not enough. The members must learn how to use it, and must use it, if they are to get their money's worth. No man's business stands alone. Every business is merely a part of the huge co-operative system by which the world's wants are supplied from day to day. Inside your plants you are successful because you organize co-operation of producing elements. You must have co-operation of your suppliers to get your materials at the right time and the right price. Your customers must have your co-operation to get your products. Whole industries co-operate with other industries, in the last analysis, and information exchanged between industries is wonderfully helpful. If the blast furnaces as a whole had information as to foundry activity as a whole, they could produce in advance of the actual orders for iron, and the consumers would not suffer the present swift movements of prices caused by shortage of supply, which is due to ignorance of the course of demand for foundry products. Instances of this kind can be multiplied without end. But the information must be used by the individual in his own business, or it will be a childish expense to gather it. An association is not only a means of gathering information, but is a means of spreading knowledge of how to use the information. It is the post-graduate school in the University of Hard Knocks. Those who look on it in that light gain benefits far more than proportional to their expenditure of dues. No other university can recruit a faculty of so many experts who are, as a body, able to throw light on such a variety of problems as any first-class trade association has among its members.

Business Conditions in the Industry

From the figures we have, it is safe to judge that since the month of July, the shipments and orders of machine tools have been gradually increasing. The increase is slow, but it is encouraging to note that there is an increase. It would probably be imprudent for machine tool builders to count on a very fast increase. Just now optimism is spreading through the country, and yet this optimism may be premature for the machine tool trade. There are many conditions operative in the business world that make a swift recovery extremely improbable, and only if it is slow will it be a sound recovery.

One encouraging thing is that more and more members of this association are giving serious study to the necessary cycles in which this industry is bound to run, and are basing their policies for the future on that study. Some of our members have learned the hard lesson that it costs too much to depend on blind guess work and mere hunch playing in laying out their business policies. Every week the office gets a number of letters asking very keen questions in connection with different cyclical phases of the machine tool business. These questions show that some of our members are giving serious study to the fundamental factors and conditions of business in general, as these affect the machine tool business.

The last two years have seen some remarkable changes in the business policy of large concerns. Banks, merchandising and manufacturing concerns have seen the wisdom of employing economists as a part of their organization. The modern development of trade associations is along the very same lines. Only if operated according to economic and statute law can any trade association survive.

As a result of this depression, the business world is getting to realize that statistics are not merely a lot of dry figures that have no interest to anyone but a delver in the past. More and more large business organizations and trade associations are spending money on statistical work that will be a guide to their future policies. The profession of consulting economist is growing in the estimation of business men. Just as they consult engineers on many questions, they now call for interpretation and correlation of economic

facts. More and more, as time goes on, will statistical compilations be taken by business men to consulting economists for individual, private interpretation.

Regional Meetings on Amortization

In the Revenue Law of 1921 there is a provision limiting the time during which amortization claims may be filed to March 15, 1922. Probably every member is entitled to some amortization deduction—many of the members overlooked this source of relief from excessive taxation. Every dollar recovered will be a larger dollar than it was when paid. The dollars paid in were small dollars as measured by the amount of product sold at the high prices and large volume of 1918. The same dollar, if gotten back now, has a larger purchasing power, and it would take considerably more production, sold with more effort, at today's lower prices, with a smaller margin of profit, to get an equivalent purchasing power back into the manufacturer's cash account.

It was evident that we could render service to those members of our association who had utterly neglected amortization as a means of relief. To call it to their attention as well as we could, we not only sent out bulletins and prepared an article for AMERICAN MACHINIST, but also had a series of regional meetings to discuss this question. It was very encouraging to find that our campaign bore very rich fruit. At every one of these regional meetings there was someone who had been neglecting amortization, and who perhaps might have continued to neglect it, except for the association's campaign on that subject. The claims filed as a result of this campaign are claims for money which the law allows the machine builder to deduct, or to have refunded if he has paid it. Many members who have had only small amounts allowed could and should now revise their old claims and claim much larger amounts.

Many otherwise valid claims have been thrown out by the Amortization Section of the Income Tax Unit, merely because of improper presentation. When such claims have been properly revised they have frequently been allowed for much greater amounts than those that were originally rejected because of poor presentation.

The Amortization Section seems inclined to fix a basis below which they consider the price of machine tools abnormal, and they may attempt to settle amortization claims on this arbitrary basis. Your general manager contends that the proper price for the taxpayer to take, both as salvage and as value in use, is the price that a second-hand dealer will pay the taxpayer for the tools on which amortization is claimed. If surplus equipment is sold, a claim is settled on that sale price as a closed transaction, and there is no question of its fairness.

Now, it is an unchangeable principle of economic law that no commodity can have two prices at the same time in the same market; and in accordance with this law of single price, the same basis should be taken for valuing amortizable equipment that may be retained in use. It cannot have a greater value in use than it has on the market. Whether the Tax Unit will accept this point of view or not remains to be seen; but whether accepted or not, it is the only logical basis that can be taken, in justice and with common sense.

Washington Trade Association Conference

Secretary Hoover called a conference of trade association representatives, which was held on April 12. This conference was called to show the trade associations how the department can be of assistance to business, and to explain the sort of information that the department would like to gather, in co-operation with the associations. Your general manager attended this conference. It was a very large and representative gathering, comprised of between 500 and 600 associations' representatives. The conference took all day, and was opened with a very good talk by Secretary Hoover, who outlined the attitude of the department very clearly.

After the presentation of various views on the part of the government officials, trade association executives were called on by Secretary Hoover, who was presiding, to indicate the sort of co-operation that appeared to them to be desirable. Among those called on was your general manager.

It was evident that the minds of many of the executives present were relieved of the fear that may have haunted them that the Department of Commerce was going to try to impose anything on the associations. They were relieved to know that the conference was called in the spirit of co-operative helpfulness, and all were imbued with the desirability of co-operation in every way that would be possible.

It may well be said that one of the constructive results of this conference will be that many more statistics of different industries will be made available, and as a consequence, business men, statisticians and students of business will better be able to fit together many of the pieces of the Chinese puzzle they are confronted with in studying the business cycles, and in studying how one industry affects another, and how the demand comes on for some products before others—in other words, the whole interdependence of industry.

Cost Work

It was unfortunate, both for the members and for Scovell, Wellington & Co., our consulting accountants, that the industrial depression discouraged the cost work begun last year, and carried to the point of establishing a set of uniform principles, on which members are recommended to base their cost finding systems. It is very desirable that those who can possibly afford it, revamp their cost systems to put them in accord with these principles. This is the very best time to make changes in methods. If members wait until faced with a rush of business, they will be unable to do good revision work on cost systems. It is best done when the organization is able to give the question proper thought.

Now is precisely the time when members should be using the over-earned and un-earned burden accounts that were recommended in our cost plan. The man who divides his total expenditure for a month by the number of hours, or other divisor used to arrive at a burden rate, now gets such a ridiculously high figure that his good sense rebels. He simply casts it aside and gets no benefit out of the labor expended on it. Such a method has been described as giving merely an exercise in long division, but not giving costs. If, on the other hand, a concern has established a normal burden rate, its costs continue comparable during this sort of period. The difference between abnormal rate and the actual expenditure is taken into the unearned burden account.

As was pointed out in the cost conferences, the use of the un-earned and over-earned burden accounts enables the executive to determine the cost of necessary idleness, which must be recouped in his sales if his company is to prosper. True, the covering of these idleness costs can be done only when business is active. The standard or normal burden rate will show up higher than the actual month's expenditures during the period of activity, and will make a much saner basis of prices than the fictitiously low rate obtained by the long division method. It therefore affords a much saner basis for prices at all times, and permits executives to formulate their policies with knowledge.

Improvement of Our Own Statistics

As stated at the October meeting, it is perfectly possible for this association to construct a first-class business barometer for the industry. The sole requisite is that the members furnish the information.

To get a really worth while barometer, we should classify orders and shipments in groups covering all classes of machines according to their prices. The following classes were suggested:

(a)	$250 and less
(b)	Over $250 up to $500.
(c)	" 500 " " 1,000.
(d)	" 1,000 " " 2,000.
(e)	" 2,000 " " 4,000.
(f)	" 4,000.

Such a tabulation of orders each month, covering all kinds of machines coming within those price classes, would give a valuable picture of the progress of demand for the whole industry. About 100 members faithfully contribute to our present barometer, but it is deceptive, because it is based on the high prices ruling in the first quarter of 1920. Price reductions since that time make it impossible to judge the unit movement now going on, compared with the first quarter of 1920. Then too, the present curve is merely an average of various percentages that have no common base. Large and small machines are all lumped together. It would be much more worth while to note the movement of the different price classes, and be able to tell what is really going on. It would take very little work in the offices of the members to classify orders and shipments according to the price classes mentioned.

It appears reasonably certain that in the past, demand for small machines has revived before demand for large ones; and that conversely, demand for large machines fell off before orders for smaller machines went off. If we could get these data from the membership and put them together, many a manager could be helped in laying his plans for future production. At present he can only guess—and that means being wrong most of the time.

Ideas from Practical Men

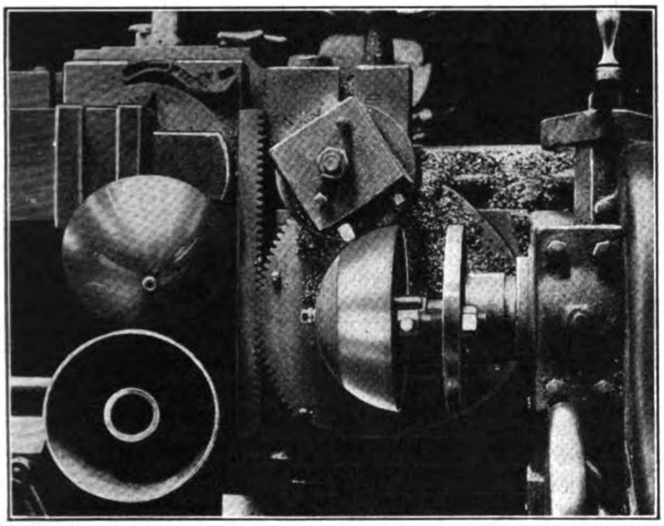
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Device for Turning a Hemispherical Casting

By S. J. Morgan

The photograph reproduced herewith was made by securing the camera in a vertical position directly over the lathe and looking down upon the work. It shows a radius turning device used in finishing the hemispherical surfaces of the frictions of toolroom drill presses that are a part of our regular line of manufacture.

The hemisphere is of cast iron and is bored, reamed and faced in a screw machine. It is then mounted upon the arbor of a special holding and driving device in the lathe and turned in the manner shown. The base of the fixture is bolted to the wings of the lathe carriage and the turning movement is imparted to it by means of a rack, attached to the cross-slide, meshing with the teeth



DEVICE FOR TURNING A HEMISPHERE

cut in the periphery of the circular member. The feed is driven by the crossfeed of the lathe.

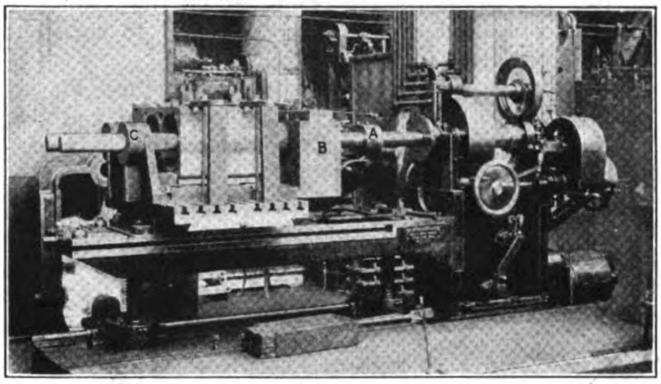
The operator polishes and balances each hemisphere before removing the casting from the arbor and the time for the complete operation averages 52 minutes.

Converting a Single-Spindle to a Double-Spindle Boring Machine

By J. M. Henry

At the plant of the Sullivan Machinery Co., Claremont, N. H. (manufacturer of mining machinery), there is an old model Niles boring machine that has been converted from a single- to a double-spindle machine by an ingenious arrangement. The machine is used for boring out twin-cylinder air compressors, one of which is shown in the illustration mounted on the table.

The regular spindle revolves and feeds in the usual



IMPROVISED TWO-SPINDLE BORING MACHINE

manner, but at *A* is shown the link which provides for mounting the two boring bars that actually do the work. This link is bronze bushed and collars on either side secured to and revolving with the bars, provide the means of feeding in and backing out.

The body of the fixture consists of a single casting, allowing for a locating surface for the work, a gear box *B* and supports for the two bars at *C*. The regular spindle extends through the link *A* and enters the gear box to provide the driving power. If the cover at the top were lifted off it would be seen that the gear box contains three spur gears, one for each spindle, splined to their respective shafts to take care of the endwise movements. The variations in speeds and feeds is controlled through the regular spindle movements.

Before this fixture was installed trouble was experienced with the single boring bar, as the pressure of the cutting tool had a tendency to break down the thin wall between the cylinders. With the two-spindle machine the cutters are so arranged that the pressure is equalized and no breakage is experienced.

Straightening Small Drill Rod

By C. B. Coe

Small wires, such as the smaller drill gage sizes of drill rod, sometimes becomes bent to such an extent that they may perhaps find their way to the scrap box. I have discovered a simple and effective way to straighten such wires, which has proved valuable to me, and it requires no special tools.

I grip one end of the wire in a drill chuck in the lathe and, with the lathe running at a fair rate of speed, rest the rod across the little finger and index finger of the right hand with the thumb pressing upon the wire between them. Starting at the chuck end, the hand is then passed slowly toward the outer end of the wire with the thumb exerting sufficient pressure upon the wire to bend it appreciably.

The rod may not be entirely straight after the first pass, but repeated trials will soon bring any but the most badly bent into shape.

Drill Press Converted to Automatic Nut Countersinking Machine

By Charles Kotersall

The device outlined in the accompanying drawings was attached to a 21-in. Barnes drill press, without elaborate alteration of the latter, for the purpose of countersinking automatically the under face of hexagon nuts of various sizes from $\frac{3}{8}$ up to $1\frac{1}{16}$ in. across the flats. The object of the device is to eliminate the necessity for the countersinking operation on the automatic screw machine and thus enable the latter to turn out four nuts per cycle instead of one.

The device is shown in projection in the three views; Figs. 1, 2 and 3 being respectively plan, front and side elevations. Like letters, so far as they appear, represent like parts in all views.

The baseplate of the device is bolted to the table of the drill press in such a position that the intersection of the two center lines *AA* and *BB* coincide with the vertical axis of the drill press spindle. Guides *CC* form a track in which the nuts may travel and are adjustable to and from each other to accommodate the different sizes of nuts within the range noted. The guides also prevent turning of the nuts under the countersink.

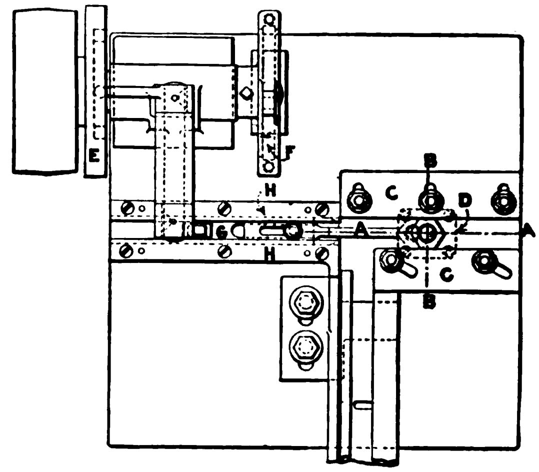
A hardened steel plate *D* is let into the cast-iron base at the intersection of the center lines to keep the nuts from wearing the cast iron rapidly at the place where the work is done.

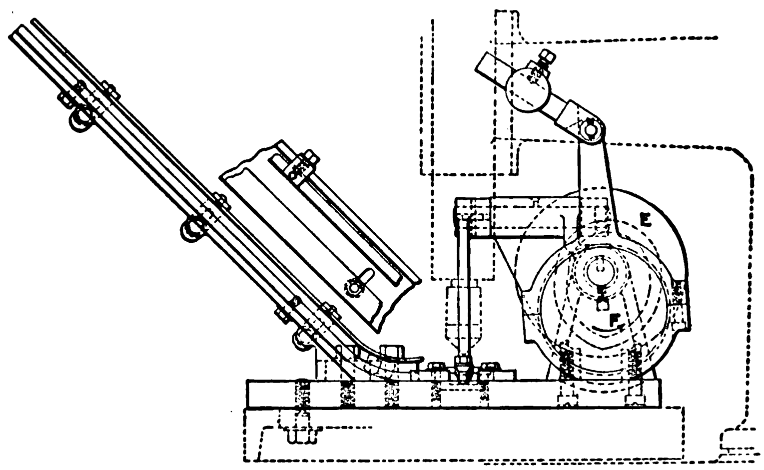
A nut-chute, shown to better advantage in Figs. 2 and 3, was taken from an Acme six-spindle nut-tapping machine and fastened to the base of this device with capscrews in such a manner that it is readily adjustable to accommodate the different sizes of nuts.

At the rear of the fixture is a bracket carrying a short horizontal shaft to which is keyed a driving pulley, the face cam *E* and the eccentric *F*. A lever having a ball end is operated by the face cam and imparts a rocking motion to a transverse shaft, to the other end of which is pinned an arm that moves the slide *G* between the guides *H*. The slide *G* at each forward movement pushes a nut before it to the countersinking position and upon each withdrawal another nut enters the runway from the chute. The slide *G* is also made adjustable to suit the nuts.

The eccentric *F* through its connections operates the pinion lever of the drill press and thus imparts a vertical reciprocating movement to the spindle. The face cam *E* and the eccentric *F* are so timed with relation to each other that the countersink is at the bottom of its stroke at the same time that the feed slide is withdrawn to allow another nut to enter the runway. As the countersink always stops at the same height on each stroke, the adjustment for depth of cut as well as for different thicknesses of nut is accomplished by raising or lowering the table of the drill press.

The feed from the chute is by gravity only and all the operator is called upon to do is to keep the chute full. A nut therefore passes into the transverse runway by reason of the pressure of the work from above, every time the feed slide is withdrawn.





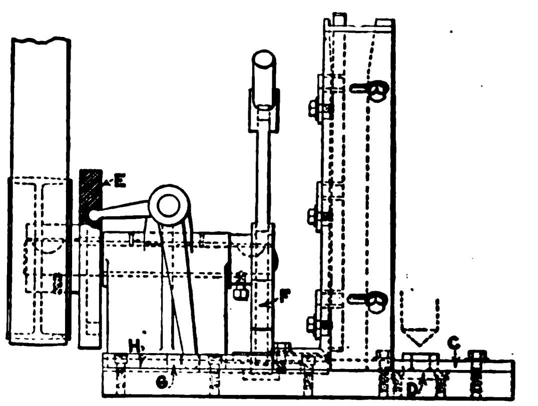


FIG. 1 (ABOVE, RIGHT). PLAN OF DEVICE FOR AUTOMATICALLY COUNTERSINKING NUTS. FIG. 2 (BELOW, RIGHT). FRONT ELEVATION OF DEVICE. FIG. 3 (LEFT). SIDE ELEVATION OF DEVICE

Use Paper Between Faceplate and Work

By Ernest E. Zeller

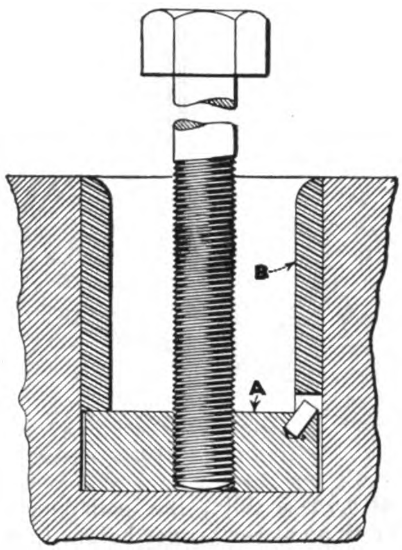
There is one thing that I think every machinist should be reminded of once in so often. It is to put a piece of paper between the faceplate and the piece to be clamped against it, and to use wooden blocks to support the clamps. Almost all machinists know that paper should be used in the manner described, but why do they not practice it? Apparently they think that they do not have time to do so, until someone gets his work, blocks and clamps all tangled up with his ears. That as a rule helps for a week or two and then it is forgotten. More work is spoiled and more accidents happen through this negligence than through any other cause.

Removing a Bushing from a Blind Hole

BY W. H. STOREY

On page 978, Vol. 55, of AMERICAN MACHINIST, Charles Reimschissel describes a method of bushing a blind hole so that the bush can be readily extracted for replacement purposes.

A firm for which I worked many years ago used this method, but it caused considerable trouble because the screwed nut or bush at the bottom used to rotate with the stud and so become ineffective. Also, considerable time was wasted in searching for the large washer and the large bush necessary to use this device.



THE BUSHING AND THE KEYED NUT

I therefore adopted the idea shown in the illustration. It will be observed that a small pin is driven into the nut *A* which fits in a groove ground into the bush *B* and so prevents the former from rotating when the screw is turned.

To extract this bush no equipment is necessary other than a standard ½-in. bolt.

Wood Plugs in Pulley Bushings

BY J. A. RAUGHT

Regarding the use of wood as a bearing material, several times mentioned in recent numbers of AMERICAN MACHINIST, I will give a few instances from my own experience.

In the planetary transmission of the Knox automobile built in 1904, there were wooden keystone-shaped plugs in the friction plates, and as I used this car myself, I know they gave satisfaction, although some one who had previously owned this car had removed several of the plugs, evidently to reduce friction.

The tumbling rod bearings on the old-time horse-power-driven threshing machine were wooden blocks, pinned to the ground with iron stakes; also the last joint of the tumbling rod which went from the separator to the ground was made of wood.

The step bearings of vertical waterwheels were made of wood. I know of one case where such a wheel was dismantled after 40 years of service and the lignum-vitae step bearing was found to be in good shape. Although thoroughly oil soaked it whittled more like soft brick than like wood.

The teeth in the bevel gears of waterwheels were, and I think are still, made of hard maple and are easily replaced. I think the reason for the wood teeth is to eliminate noise. The shaft bearings on some of the older waterpower plants were also made of wood. Some of those old plants are in existence today.

My father had a large weight-driven clock of Seth Thomas make, all gears of which were made of wood. The only metal part in the movement was the escapement.

The old-time farm wagon, although made nearly the same as it is today, was minus the cast-iron skein. The axles were wood (burr oak, I think) the ends of which served as bearings.

Although I am not an advocate of wooden bearings for all purposes, I think there are many places where they may be used to better advantage than metal.

Match Plate Pattern for Small Castings

BY E. F. OAKFORD

After reading E. A. Dixie's article on the above subject on page 809, Vol. 55, of AMERICAN MACHINIST, and tabulating the numerous operations described I brought the article to the notice of the foundry committee, which meets daily to discuss matters of interest regarding foundry work in the plant in which I am employed. The consensus of opinion was that a good deal of the work described by Mr. Dixie was unnecessary, and that a much simpler method of making the match plate could have been adopted.

Some time ago the writer contracted to supply four thousand iron castings somewhat similar to those described by Mr. Dixie—and owing to extreme urgency, delivery was promised in one week. One hardwood pattern with a short print at one end to support the center core as shown in the shaded portion in Fig. 1 was sent with the order.

The job was started at once, one patternmaker drilled the holes, 1 to 24, in the match board Fig. 2, while another turned up twenty-four solid patterns from a length of square sectioned hardwood, in a hollow spindle pattern-shop lathe. Allowance for draft was provided and the shanks of the patterns were increased in length equal to the thickness of the matchboard, as shown in Fig. 3. The twenty-four holes in the matchboard were drilled to the diameter of the pattern shanks. As soon as the plate was drilled the patterns were inserted in their respective holes, as in Fig. 3, fixed in position and the necessary gates shown in dotted lines in Fig. 1, fastened in place. A small hole for the runner stick was drilled at point 25. Two coats of varnish were applied, and the completed match plate was ready for use.

Owing to the free venting nature of our sand, it was not necessary to provide risers from any of the castings for such small work.

Twenty-four castings were made per flask and an output of between 50 and 60 flasks per day was secured, so that practically all the castings were delivered within the scheduled time.

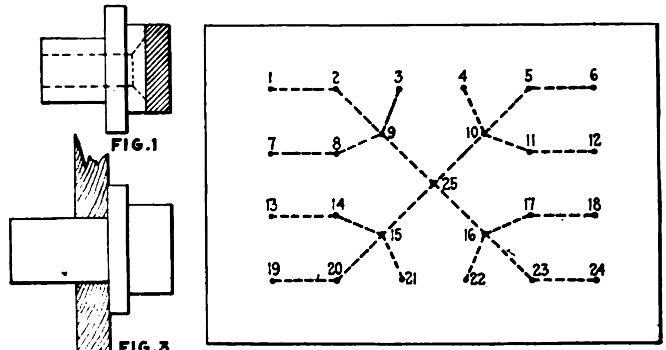


FIG. 1. PATTERN SENT WITH THE ORDER. FIG. 2. PLAN OF THE MATCH PLATE. FIG. 3. SECTION OF MATCH PLATE WITH PATTERN IN PLACE

A Shop Man's Method of Figuring Change Gears—Discussion

By W. G. Andrews

On page 78 of American Machinist, under the above title, J. Crommell gives a method of figuring change gears which is very good as far as it goes, but I think the hardest part has been left out (that is the hardest part for most men I have met), that of figuring compound gearing where finer or coarser threads are to be cut.

I will submit a method I use which is simplicity in itself.

As the pitch of the lead screw is to the pitch of the screw to be cut, so is the number of teeth in the wheel on the mandrel to the number of teeth in the wheel on the lead screw.

To calculate compound gearing proceed as follows:

Lead screw, 4. Thread to be cut, 40. Proportion, $\frac{4}{40}$. Factoring we have $\frac{4}{40} = \frac{2 \times 2}{5 \times 8}$. Multiplying by ten we get $\frac{20 \times 20, \text{ driving gears}}{50 \times 80, \text{ driven gears}}$. These wheels are always mounted as follows:

$$\frac{\text{Driving wheel on mandrel} \times \text{Driving wheel on stud}}{\text{Driven wheel on stud} \times \text{Driven wheel on lead screw}}$$

Another example:

Lead screw, 2. Thread to be cut, 25. Factoring we have, $\frac{2}{25} = \frac{2 \times 1}{5 \times 5}$.

As it is only necessary to multiply each pair of factors by the same number, we will multiply the first pair by 10 and the second pair by 20. Result $\frac{20 \times 20}{50 \times 100}$.

If any doubt exists as to the correctness of the calculation, the result may be easily tested as follows: Multiply the number of teeth in the driving wheels together, place these in fractional form and reduce to lowest terms. The figures obtained should be the ratio of the lead screw to the screw to be cut as expressed in lowest terms.

The proportions in the first example are 4/40 and the gears found were $\frac{20 \times 20}{50 \times 80} = \frac{\text{driving gears}}{\text{driven gears}} = \frac{400}{4{,}000}$.

By cancellation we have $\frac{400}{4{,}000} = 4/40$, the original ratio of the pitch of the lead screw and the thread to be cut.

This method of figuring gears proved valuable to me many times and it is very easy to remember.

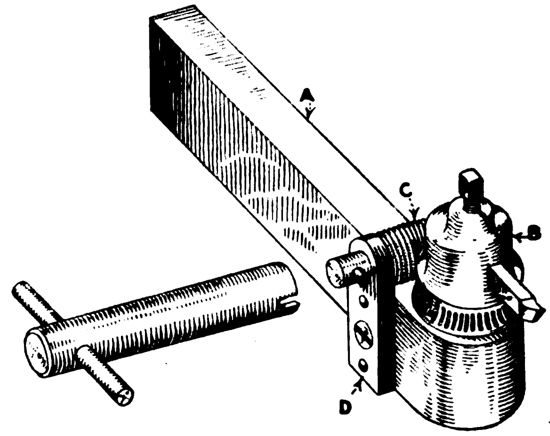
Home-made Radius Turning Tool

By K. A. Munson

The radius tool shown in the accompany sketch was made up for turning large fillets of 1 and 1¼ in. radius on a lot of valves to be machined from brass castings. As the shape had to be fairly accurate and the castings were not stiff enough to permit the use of a flat form tool, this radius tool, which took only a few hours to make, was used with very good results.

The toolholder support A was shaped down to standard ½ x 1 in. tool size to fit toolpost in lathe. A head was left on one end of this toolholder support in which was bored a hole to receive the shank of the swinging toolholder B. The toolholder was made a nice turning fit in the support and secured by means of a washer and nut on the under side. A hole was broached in the toolholder to receive a 3/8 in. square toolbit, and a setscrew provided for clamping it.

The toolholder B was turned up similar to a small worm wheel blank, as shown, and the teeth in it were



A RADIUS TURNING TOOL

cut by assembling the toolholder and support and clamping them at the proper height in the toolpost. A ½-in.-13 U. S. S. tap was dogged between centers in the lathe, and by feeding in the toolholder slowly and using the tap as a hob, the teeth were very quickly cut without the necessity of gashing.

The worm C was a ½ in.-13 stud turned down at both ends for the side plates D. Both worm and toolholder were cyanided to give as much life to the teeth as possible

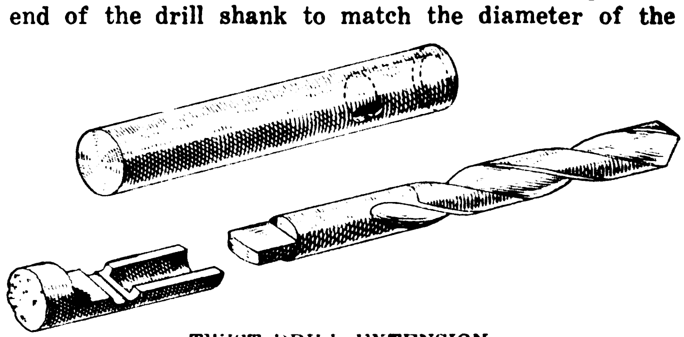
Extension for Small Twist Drills

By F. R. McCurdy

A quickly and easily made extension for small twist drills is shown in the cut herewith.

Take a pice of cold-rolled rod somewhat larger in diameter than the drill it is desired to extend and, at a safe distance from the end, drill a crosshole smaller in diameter than the drill. Plug this hole and then drill a second hole to cut into the first one as shown.

Now knock out the remains of the plug and, with the drill it is desired to extend, drill a hole into the end of the rod as far as the crossholes. Next file flats upon the end of the drill shank to match the diameter of the



TWIST DRILL EXTENSION

crossholes, and drive the drill into the end of the rod so that the flatted end enters the slot made by the two crossholes.

The writer has drills and taps extended in this way that have been in service for ten years.

Editorial

Are We Downhearted?

THE beginning of President A. H. Tuechter's address to the Machine Tool Builders at Atlantic City has in it this question, "Are we downhearted?" He answered it with an emphatic no and his sentiments were those of the great majority of members present. And with good reason.

Some saw the new radio industry absorbing all their stocks of certain models and crying for more, most of them had taken on men, all of them had more inquiries and generally better business in April than in many months. One manufacturer was heard to say that if the remaining months of the year were as good as April he would have nothing left to ask for.

The report of the association's general manager told of a slow improvement in business trend since July, 1921. A warning not to expect anything startling in the way of rapid recovery was also included but the substantial nature of what is going on is further indicated by the fact that the figures, being on a dollar basis, do not reflect the real improvement. Not only is the dollar of 1922 more valuable in purchasing power than that of a year ago but machine tool prices are considerably lower and consequently there would be a much more evident increase in shipments if tons or number of machines were the units used.

Sentiment is a big factor in the business world and has much to do with the fluctuations which make up the business cycle. When it is optimistic and has the backing of the cold figures of the economic statistician to back it up, we may well take heart. The year 1922 may not prove to be a very profitable one for machine tool men but it is starting out with a promise far beyond expectations.

Machine Tool Standardization

A STEP that means much to the men who use machine tools was taken at the spring convention of the National Machine Tool Builders Association. By invitation of the American Engineering Standards Committee the association becomes joint sponsor with the American Society of Mechanical Engineers for standards for machine tool elements.

As told in the report of the meeting on another page the A. S. M. E. committee has been appointed and an organization meeting with machine tool men has taken place. Perhaps too much emphasis should not be placed on the preliminary steps in the attempt to secure machine tool standardization. Other committees have been appointed and have accomplished little.

We must confess, however, to a feeling of confidence that something will be accomplished by the new committee. The user is becoming wide awake to the meeting of standardization in dollars and cents and his voice is being listened to with flattering attention by the manufacturer at the present time. According to the present arrangement he is to have a voice in this standardization movement through the A. S. M. E. representation on the committee. When the work gets down to brass tacks he will have a further chance to say what he thinks should be done and he will have only himself to blame if the standards that are finally adopted do not meet his requirements.

Standardization has also a direct money-saving appeal to the manufacturer. Simplification of product and elimination of unnecessary sizes can accomplish wonders in the machinery industry as they have in other industries. Personal preferences in minor matters may have to go by the board for the general good but even though such action hurts at first, it is soon forgotten. Does anyone look back with much envy to the days when there were no screw thread standards?

A Question of Prices

ONCE in a while we find a buyer of machine tools who appreciates their value and also the question of price. One such buyer made ice cream freezers for hotels. He had bought a boring machine and as the maker happened to be in town shortly afterward he dropped in to see how things were going.

"Fine machine you sold me," said the buyer. "Does my work well—does it quickly, does it accurately. But if you'll pardon my apparent rudeness I'll say you were a d—— fool to sell it to me for two thousand dollars.

"That machine will bore more ice cream freezers than I can ever sell. I'll never have to buy another. You've made your only profit on me and I'm making mine on you every day. My ice cream freezer isn't half so much of a machine as yours. Its rough and crude in comparison. Yet I get as much money for it as you asked me for your high-grade, accurate machine. My machine lasts for years also, so I charge a high price for it as the user gets his profit out of it for years and years. You ought to do the same."

Opportunities for New Machine Operations

A RECENT incident may point out a lesson with great possibilities. A machine builder and a "five and ten" merchant were recently traveling together, and the subject of bent-end curtain rods came up. It developed that, in spite of being sold in the ten-cent stores, the rods were all bent by hand.

The machine builder got buzy and designed a machine for the job. Then he got the name of the maker from the "five and ten" merchant and promptly sold him several machines.

This is another example of the point brought out by Mr. Berry, of the Warner & Swasey Company, some time ago in these columns. They found that by careful study and intensive work 60 per cent of their sales were to lines which had not previously been considered as possible customers.

If ten-cent curtain rods are being built by hand, how many other articles are equally susceptible of cost reduction by machine methods? What better work for a live trade association than searching for outlets in new fields, for the products of its manufacturers?

Shop Equipment News

Cross Gear-Tooth Rounding Machine

The Cross Gear and Engine Co., Detroit, Mich., has recently re-designed its gear-tooth rounding machine, which was described on page 438, Vol. 46, of AMERICAN MACHINIST. The machine, shown in Fig. 1, is intended for accurately rounding at high speed the corners on the ends of gear teeth. This action can be performed on spur gears of both the straight-tooth and the helical type, as well as on both the inside and outside edges of spiral bevel gears and pinions.

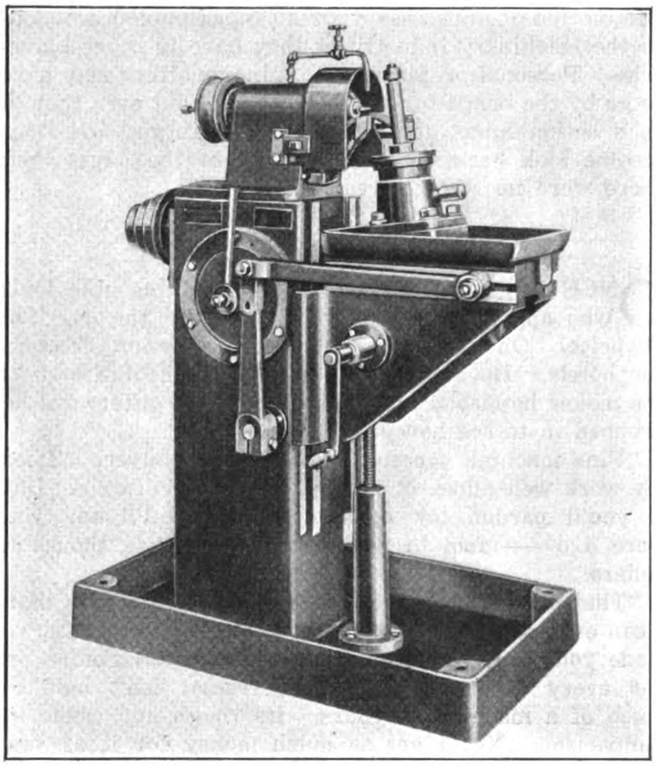


FIG. 1. GROSS GEAR-TOOTH ROUNDING MACHINE

Gears of any pitch within the capacity can be finished with but minor adjustments of the machine. Stem gears, cluster gears, gears integral with the shaft and those cut close to a shoulder can be finished. The operation is performed at high speed, so that the machine can be employed for large-scale production. The construction of the machine and the method of locking the gear in position provide rigidity. A production of 40 to 45 teeth per minute on certain classes of work is stated to be maintained continuously. Due to the fact that the machine is entirely automatic in operation, no particular degree of skill is required by the operator. A smooth finish is obtained and cutter breakage is very slight.

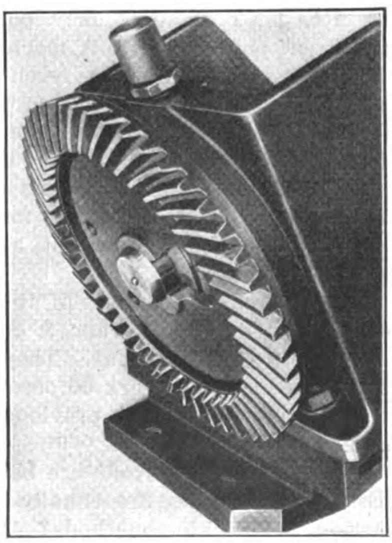


FIG. 2. HEAD FOR HOLDING SPIRAL BEVEL GEARS

The cutter is rotated at high speed by a belt on the pulley at the rear of the head. The cutter spindle runs on ball bearings mounted in a housing that is set eccentrically in a quill in the head of the machine. The amount of eccentricity can be varied to suit the thickness of the tooth being rounded. The spindle thus oscillates through a semi-circle, traveling across from one side to the other of the tooth profile. The quill is mounted in adjustable taper bearings to give compensation for wear. The adjusting nut is at the rear of the head. The screws for adjusting the eccentricity pass through the taper bearings. A gear on the back taper bearing engages with gearing driven from a vertically oscillating rack operated by mechanism in the column.

The gear is held in position on a table in front of the head. A stop immediately below the cutter fits in the space between the gear teeth, so that the tooth is held rigidly in place while being finished. It is not necessary to center the gear accurately, as the stop itself holds each tooth in the proper position for cutting. When the cut is complete on one tooth, the work table slides forward and the work indexes. The same mechanism that sets the eccentricity of the cutter spindle automatically adjusts the indexing for any number of teeth of the required pitch.

The machine can be furnished with special heads for carrying the gears. A large head is used for heavy gears, such as those on the rims of flywheels. For gears mounted on shafts, provision is made to extend the shaft through the table. Bevel gears are mounted at an angle, so as to bring the edge of the tooth in the same position as that ordinarily occupied by a spur gear tooth. In Fig. 2 can be seen an indexing head for holding spiral bevel gears. Other attachments suited to special work can be furnished.

The machine can be equipped for motor drive, the motor being placed on a separate base at the rear, and belted through a countershaft to overhead pulleys carried at the back of the machine. An oil pump, piping and guards, as well as a cutter, arbor and gear-holding head, are furnished with the machine.

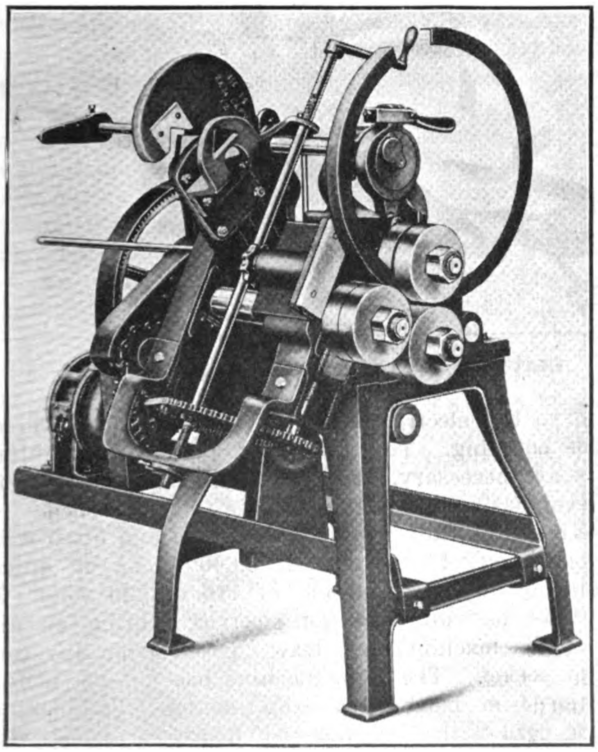
The machine is made in three sizes. The No. 1 has a capacity up to 24 in. in diameter on gears of 4-pitch or finer and of 16 in. on gears up to 2-pitch. It occupies a floor space of 3 x 4 ft. and has a weight of 1,700 lb. The No. 2 machine can handle gears up to 4-pitch 36-in. in diameter, and up to 2-pitch 30 in. in diameter. The floor space is 3 x 5 ft. and the weight 2,100 lb. The No. 3 machine handles gears of 1 to 4 pitch up to 60 in. in diameter. It requires a floor space of 4 x 7 ft. and weighs 4,200 pounds.

Excelsior No. 14 Angle-Bending Machine

The machine shown in the accompanying illustration is intended for bending angle iron into circular form. It has recently been placed on the market by the Excelsior Tool and Machine Co., East St. Louis, Ill., and is designated as the No. 14 machine. It will cut to length and bend angle iron up to 2 x 2 x ¼ in. in size, and a true circle can be formed without twisting or defacing the angles. Bar iron and T-iron can also be formed with the same rolls, which are adjustable in position to suit the requirements. Special rolls are required for pipe and channel iron or other unusual shapes.

All three roll shafts are driven, so that small circles can be rolled by one pass through the machine with the ends actually closing together. There are two rolls on each shaft, and steel washers are placed between each pair of rolls to allow for the insertion of one leg of the angle. Each roll has one straight and one rounded edge. This equipment permits of rolling circles with the flange to either the inside or the outside. A guide insures that the angle iron takes the proper path and is not distorted. On angle iron 1½ x 1½ x 3/16 in. in size, circles as small as 14 in. in diameter can be formed by two passes through the machine.

The machine is equipped with a friction clutch, and can be adapted to either belt or motor drive. It can be started or stopped with the work under pressure. The frame is semi-steel, and the rolls are made from



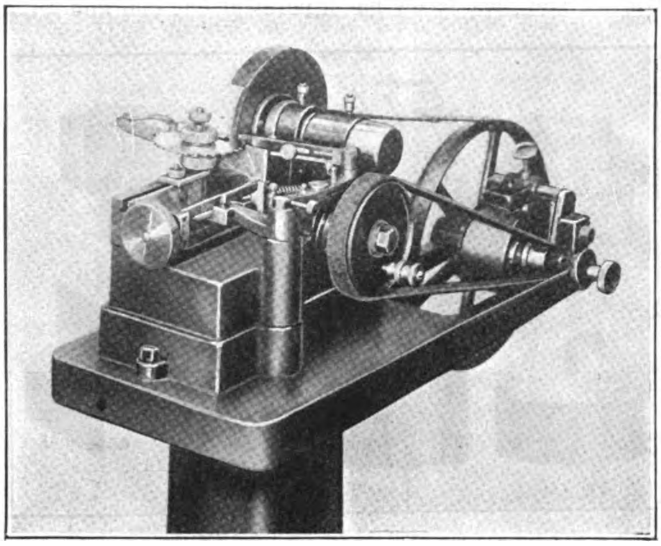
EXCELSIOR NO. 14 ANGLE BENDING MACHINE

forged and hardened tool steel. They are driven by gears with a 14:1 ratio from the driving pulley. This pulley ordinarily rotates at 200 r.p.m., and 3 hp. is required to operate the machine.

The machine may be furnished either with or without the cutting attachment or the motor drive. It has a height of 5 ft. and requires a floor space of 4 x 5 ft. It weighs 1,800 lb. without the motor and shearing attachment, the weight of the latter being 200 pounds.

Scherr Automatic Saw Sharpening Machine

George Scherr, 126 Liberty St., New York, N. Y., has recently added a No. 2 size to his line of automatic saw sharpening machines. The machine is larger than the



SCHERR NO. 2 SAW SHARPENING MACHINE

No. 1 model, and intended for sharpening circular saws from 1½ to 8 in. in diameter. It is used on all types of circular metal saws, screw slotting cutters and jewelers' and slitting saws. The machine, as shown in the accompanying illustration, is self contained and mounted on a cast-iron column.

Saws up to 3/16 in. thick and having holes from ⅜ to 1 in. can be handled. Indexing is done by means of the saw being sharpened, so that variations in distance from tooth to tooth cause no difficulty. The machine will feed saws with teeth broken out, so that damaged cutters can be re-conditioned.

The machine carries a wheel 4½ x ⅜ in. in size, the bearings of the grinding spindle being tapered so that adjustment for wear can be made. The tight and loose pulleys are 3 in. in diameter and ordinarily run at 650 r.p.m. The machine measures 12 x 24 x 36 in., the column being 30 in. high. The net weight is 135 pounds.

Marvin & Casler Jack, Blocks and T-Slot Nut

The Marvin & Casler Co., Canastota, N. Y., has recently brought out some equipment for use on the tables of machine tools when setting up work. The T-slot nut shown at the right of Fig. 1 is intended particularly to permit of putting additional clamps on work secured to a machine table, although it can, of course, be employed when the work is first clamped down. If an additional bolt is needed on the set-up, the nut can be slid in position from the end of the T-slot and the stud or bolt with its clamp can be inserted from above. In this way, it is frequently possible to avoid resetting the work, as would be necessary to add T-head bolts of the ordinary type.

There is no danger of the nut injuring the T-slot, as happens with a T-head bolt which is permitted to turn in the slot and damage the edges. The nut presents a large wearing surface to the slot. Its use permits of a reduction in the cost of clamping equipment, as studs of all lengths can be employed with it. The nut can

be furnished with threads from ½ to 1 in. in diameter. The widths of the heads vary from 1 3/16 to 2 in. and the lengths from 1½ to 3 inches.

On the left of Fig. 1 the top illustrations show jacks that are for use on machine tables when leveling the work. The jack screw has a point at one end and a flat surface on the other. Thus, either end of the screw can be brought in contact with the work by merely reversing the position of the jack. The screw has an extension of ⅝ in., and its pitch is fine enough to prevent it from running down while the cut is being made. For small heights, the jack may be placed directly on the table of the machine, its minimum height being 1¾ in. to the top of the point and 1½ in. to the top of the flat surface.

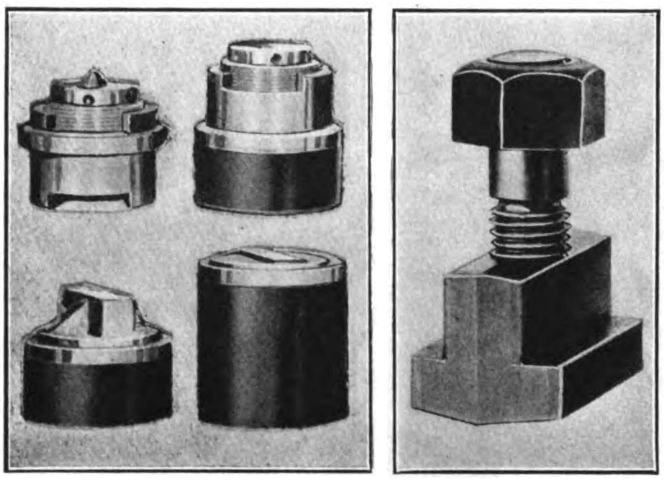


FIG. 1. MARVIN & CASLER T-SLOT NUT, JACKS AND EXTENSION BLOCKS

When desired to increase the height of the jack, tubular extension blocks are placed under it. The blocks fit around the jack, the flange of which bears on the top of them. Several extensions can be placed on top of each other, so as to provide a block of any height necessary. Two of the extensions are shown at the bottom on the left-hand side of Fig. 1. It will be noted that there are blocks on top of each extension; they are employed both as bearing surfaces for the work and as locaters to use between sections of the extensions.

The extension or tubing is about 2⅜ in. in outside diameter and made up in lengths of 1, 2¼, 4¾ and 9¼ in. Fig. 2 shows a large aluminum casting clamped to the table of the machine and supported by the jacks and extension blocks. The flexibility of the arrangement should be noted, as it is possible to quickly obtain the exact height necessary under any part of the work.

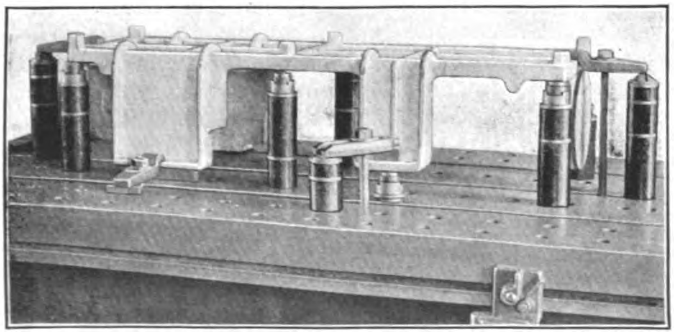


FIG. 2. WORK SET UP ON JACKS AND EXTENSION BLOCKS

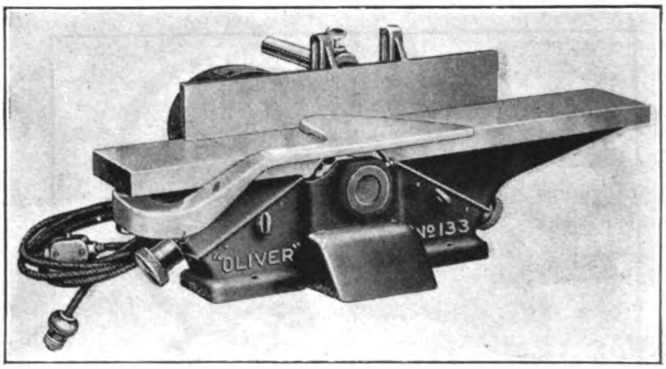
Oliver No. 133 Hand Planer and Jointer

A portable, ball bearing, motor-driven hand planer and jointer that is intended for mounting on a bench has recently been placed on the market by the Oliver Machinery Co., Grand Rapids, Mich. The machine is designated as the No. 133, and is made in 4- and 6-in. sizes. The 6-in. machine planes 6¼ in. wide, and the 4-in. machine 4¼ in. wide. Both sizes rabbet up to ½ in. The machine is intended for replacing the hand plane when jointing and fitting wood.

The base is a one-piece casting, and carries all of the parts of the machine, so that the whole unit may be easily moved from one place to another. The tables are mounted on inclined dovetailed ways, and are raised and lowered by means of handwheels and screws. Each table has a steel lip next to the throat opening. The full height of the table is 6 inches.

The fence can be quickly adjusted to any position on the tables, and tilted and locked. When not in use, it may be moved back and swung out of the way. An aluminum safety guard that operates automatically is provided on the table. It keeps the unused portion of the knives covered, and yet does not interfere with the operation of the machine.

The cutter head is fitted with three tungsten-chromium steel knives, each ⅛ in. thick and 1 in. wide. The cutting diameter is 3½ in. The head runs on self-aligning, inclosed ball bearings, and is directly connected to the electric motor by means of a universal flexible coupling. Thus, no belts, pulleys or countershafts are necessary, and the machine may be set up wherever desired without reference to a line shaft.



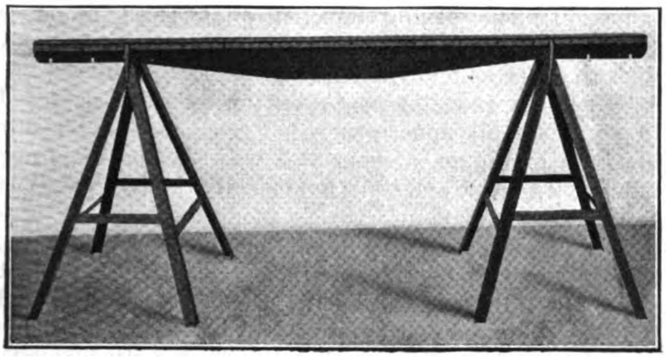
OLIVER PORTABLE PLANER AND JOINTER

The motor is fully inclosed, ventilated and fitted with ball bearings. It operates at 3,600 r.p.m. on either alternating or direct current of 110 or 220 volts. It may thus be run from an electric lighting circuit, so that the machine may draw current from any convenient socket. The 6-in. machine has a ⅓-hp. motor, and the 4-in. machine a ¼-hp. motor. The flexible electric cord with plug and switch are furnished with the machine. A rotary snap switch is provided when an alternating current motor is used.

An attachment may be furnished for setting and sharpening the knives, so that they all cut uniformly. A cast-iron column for supporting the machine from the floor can also be provided. The bench space required by the 4-in. machine is 26 x 16 in., and by the 6-in. machine 32 x 18 in. The machines weigh 130 and 160 lb., respectively, when crated, and 165 and 200 lb. when boxed. The contents of the export boxes are 3 and 4 cu.ft. respectively.

Eureka Demountable Steel Trestle

Reinhold Bettermann, Johnstown, Pa., has recently placed on the market a demountable trestle or "horse" for use in an industrial plant to support work. The principal feature of the device is that it is made entirely of steel.



EUREKA DEMOUNTABLE STEEL TRESTLE

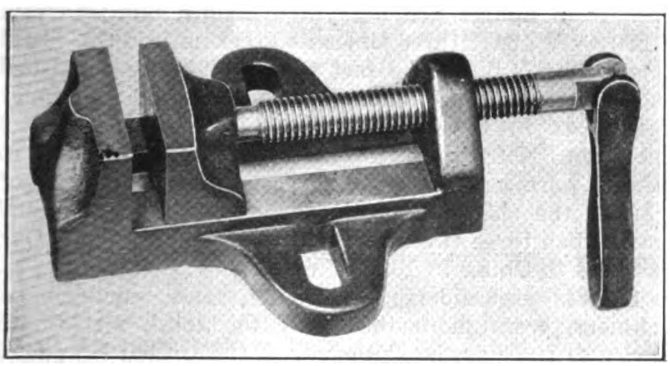
The stools have four legs each, and are of pyramid form. They are heavily braced so as to provide rigid support. They can be used individually for supporting automobile rear axles and such work, being particularly applicable in a garage. The stools are also made with a special slot at the top, for use under axles fitted with truss rods.

To form the trestle, two stools support the T-bar. Notches in the bar permit of varying the distance between the stools. Because of the fact that the device can be readily dis-sembled, the horse can be easily stored, and takes up but a small amount of space. The stools may be stacked one on top of the other. Because of the construction, their life should be practically unlimited. They are made in heights from 13½ to 30 in., the weights varying from 11 to 30 pounds.

Steel trestles with the legs riveted to the T-bar can also be supplied, when it is not necessary to have the device demountable. The standard size is 30 in. height and 42 in. length.

Austin Drilling Machine Vise

The J. L. Austin Manufacturing Co., 419 Van Buren St., Milwaukee, Wis., has recently brought out the vise shown in the accompanying illustration for use on drilling machines. The vise is intended for quickly securing small parts requiring drilling, so that such pieces are not held in place by hand. Special jigs and fixtures are not necessary for many drilling operations, because the parts can be securely held by means of the vise.



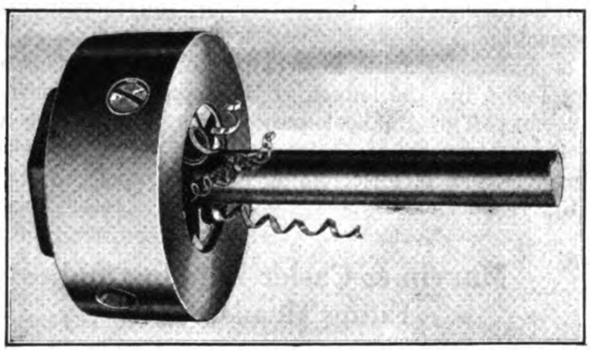
AUSTIN DRILLING MACHINE VISE

The vise is made of cast iron and intended to withstand hard usage. Two flanges on the base permit of attachment to the table of the drilling machine. The handle is so secured to the end of the operating screw that it can be swiveled to permit of operation in cramped positions. The jaws are 3 in. wide and 1½ in. deep; they open 4 in. The ¾-in. screw has an Acme thread. The weight complete is 10 pounds.

Conant & Donelson Screw Cutting Die

An addition to the line of "Reliable" two-part screw cutting dies made by Conant & Donelson, Conway, Mass., is shown in the illustration. It is made in all commercial sizes from 3/16 in. upward and fits the same collets as corresponding sizes of the regular product.

The feature of the new die is the way in which the face is ground to curl the chips ahead of itself instead of allowing them to fill and clog the clearance spaces. The manner in which this object is accomplished is by undercutting the edges in a sharp diagonal, following the principle that was long ago applied to the comparatively well-known "gun" tap to secure the same effect when cutting internal threads.



CONANT & DONELSON SCREW CUTTING DIE

The advantage claimed for this die is that it is a free cutting tool with less likelihood of being broken by reason of chips becoming wedged in the clearances.

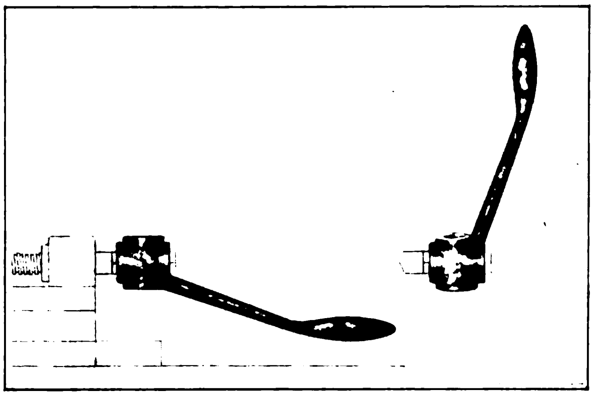
Bentley & Holmgren Vise Handle

In order to permit of quick operation in positioning the movable jaw of a screw-type milling machine vise, the B. & H. vise handle has recently been brought out by Bentley & Holmgren, 406 Court Exchange Bldg., Bridgeport, Conn. The ordinary handle placed at right-angles to the screw does not permit of quick operation, and frequently interferes with the table or some part of the setting, so that it is necessary to turn it through only a portion of a turn and then remove and replace it for the next twist. Also, it very frequently happens that the handle is permitted to strike the table at the completion of each twist, so that injury is done to the machine itself.

The B. & H. handle is a one-piece drop forging, and casehardened. It has two square holes at right-angles to each other in the boss. The handle is so positioned in relation to the boss that when it is applied in one position, as shown at the left of the accompanying illustration, it swings clear of the table and can be rapidly revolved. Applied in the other position, as shown at the right, it gives a long lever that permits of tightening the screw.

It is stated that an adjustment of 2 in. of the vise

jaw that may normally require 40 sec. with a handle at right-angles to the screw can be performed in 3 sec. When the handle is not in use, it is fastened in the first-mentioned position, so that there is no danger of



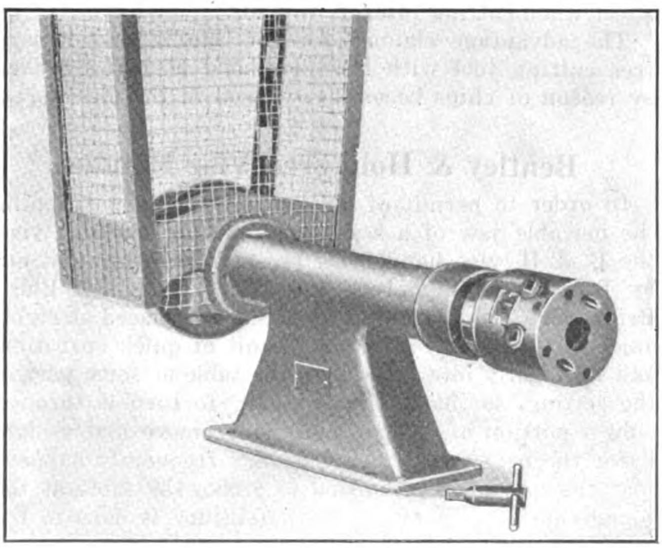
BENTLEY & HOLMGREN VISE HANDLE

its interfering with the cutter or the movements of the machine.

The handle is made in a range of sizes having holes from $\frac{1}{2}$ to $\frac{7}{8}$ in., the length of the hubs varying from $1\frac{1}{4}$ to $2\frac{1}{4}$ in. The smallest handle has a clearance with the short leverage of $1\frac{1}{4}$ in., and of 5 in. with the long leverage. The largest handle has clearances of $2\frac{7}{8}$ and $9\frac{1}{2}$ in., respectively.

Marvin & Casler Lapping and Filing Headstock

A lathe headstock for use when lapping and filing small parts has recently been brought out by the Marvin & Casler Co., Canastota, N. Y. The accompanying



MARVIN & CASLER LAPPING AND FILING HEADSTOCK

illustration shows the device equipped with a guard for the driving belt.

The tool is fitted with ball bearings at each end of the spindle. It is intended for use in lapping small holes, so as to take the work from a more expensive lathe. It may be equipped either with a twin-screw drill chuck or a three-jaw chuck. The base of the headstock is $10\frac{3}{4}$ in. long, and the distance from the pulley to the drill chuck is $14\frac{3}{8}$ inches.

Pocket-Knife Standardization

What has been done toward standardization of designs in the pocket-knife industry is shown by the following paragraphs from a report of a trade association in that industry. The saving effected might well influence other industries to follow the example particularly in lines that are as many and varied as pocket knives.

"When our industry was called on by the War Board to eliminate all unnecessary patterns and reduce our line to a minimum, a committee was selected from our industry to adopt a certain number of standard patterns and request all manufacturers to discontinue the producing of anything other than these standard patterns.

"We found when we came to get into this work that some factories were producing as high as a thousand to fifteen hundred distinct styles of pocket knives. This number was reduced to one hundred basic patterns, with about three hundred styles being produced from them. This included different coverings, handles, blades, etc.

"The number of basic patterns in the American pocket-knife industry varied in the different factories from two hundred to five hundred, from which were developed styles ranging anywhere from five hundred to twenty-five hundred. This number of basic patterns has been reduced, not to exceed one hundred and not to be developed beyond three hundred. Possibly some manufacturers today are developing as high as three hundred patterns, but you can see that this is a tremendous reduction in basic patterns, as well as the number of styles developed from them."

Variations in Machinery Exports

The value of our exports of passenger automobiles dropped from $2,356,699 in 1920 to $32,803 in 1921, partly because the market was saturated, and because the total absence of good roads between the large cities confines the use of cars to the streets of a few commercial centers. Competition from Germany and other countries was largely responsible for the decrease in our exports of dyestuffs from $6,309,168 in 1920 to $763,427 in 1921, although even this figure is gratifying when we consider that we sent practically no dyestuffs to China in 1913-14.

The marked increase both in number and value in shipments of locomotives from 20, valued at $328,629, in 1913-14, to 86, valued at $3,370,510, in 1920, and to 104, worth $5,119,837, in 1921, has been the result of American selling enterprise and of the need of first-class motive power on the Chinese railways. This is only one feature in the general increase of our exports of industrial machinery to China, for which the full American figures are not yet available, but which in 1920 were about three times as great as in 1913. Still more gratifying is the fact that in 1920 we furnished 54 per cent of the total amount of industrial machinery purchased by China, while in 1911 we shipped only 9 per cent. Our exports in 1920 of textile machinery to China were more than 50 per cent of the total, about double the shipments from the United Kingdom, and more than three times as great as those of Japan. Our exports to China in 1920 of machinery, excluding agricultural, embroidering, knitting, and sewing machinery, were more than half the total, more than twice as large as the shipments of the United Kingdom, and more than three times as great as those of Japan. —*Commerce Reports.*

News Section

Price of Farm Implements Not Advancing

In a statement as to farm implements, Chairman Anderson of the Congressional Agricultural Commission which is investigating agricultural conditions says:

"We have found that the weighted average of farm implements' factory price, exclusive of power equipment and twine, shows that price to be 41 per cent above 1913; inclusive of power equipment and twine, these prices are now approximately 20 per cent above 1913. It would appear that the factory price of agricultural implements does not show price advances to such a marked degree as other commodities and that they are rapidly receding to a lower price level. In 1914 the transportation charge on agricultural implements was about 11 per cent of the selling price to the farmer, including the freight on raw material entering into the manufacture, and in 1921, it increased to 15 per cent. A reduction in freight rates on each basic commodity, such as pig iron, steel, coal coke and lumber, would assist in reducing the farmer's expense for farm implements."

Tests for Toolbits

The Bureau of Standards of the Department of Commerce has completed a series of sixty tests of one-half inch toolbits made of several grades of high-speed steel which had been subjected to various heat-treatments. The steel used was the same for each test, containing 62 per cent carbon, 3.5 per cent chromium, 15.5 per cent tungsten, and 1.6 per cent vanadium. Results, in pounds of metal cut away, are shown in the following table:

Preheating (Time for Cut 20 Min.)	Hardening (Time for Cut 5 Min.)	Lb. of Metal Cut Per Tool (4 Tools Tested.)
1,400 deg. F.	2,417 deg. F-oil	9.1
1,500 deg. F.	2,417 deg. F-oil	10.1
1,600 deg. F.	2,417 deg. F-oil	5.1
1,600 deg. F.	2,417 deg. F-water	5.1

All testing conditions were the same. The results obtained when using water as the quenching medium are about the same as when using oil for this particular case.

House Drops Dahlgren Naval Station

During consideration of the naval appropriation bill by the House, Maryland representatives were successful in eliminating appropriations, other than those for maintenance in a closed down condition, for the naval proving ground at Dahlgren, Va. The House eliminated the appropriations by a vote of 106 to 67. Maryland representatives contended that as it was a war emergency plant it should be abolished.

Sinram Re-elected

At the annual meeting of the American Gear Manufacturers' Association, held recently at Buffalo, F. W. Sinram, president of the Van Dorn & Dutton Co., of Cleveland, Ohio, was re-elected president for the ensuing year. The vice-presidents chosen are Ray Johnson and D. F. Waterman. F. D. Hamlin was re-elected secretary-treasurer. Four new members of the executive committee were elected; they are J. B. Foote, E. E. Frost, D. F. Goedke and W. H. Phillips.

International Chamber in Italy Next Year

The next general meeting of the International Chamber of Commerce will be held in Rome, Italy, the week of March 19, 1923, it was announced last week by the American section of that body. In arriving at this decision the board of directors of the International Chamber which just met in Paris, was influenced to a great extent by the possibilities of the Genoa conference.

The next meeting of the executive committee of the International Chamber will be held in Paris on May 26 and will be followed by a meeting of the board of directors on July 10. At that time it is expected that the results of the Genoa Conference will be fairly definite and plans will then be made for the next general meeting of the chamber.

Motion Pictures in Development of Foreign Trade

At a conference of manufacturers with various government representatives last week, the value of motion pictures in industry was discussed. Director Klein, of the Department of Commerce, said that 17 per cent of American manufactured mechanical machinery was exported and that motion pictures were valuable in the development of foreign trade. Director Bain, of the Bureau of Mines, spoke of the valuable results obtained by that Bureau with motion pictures in promoting safety in mining operations. A board of review was established by the two bureaus to aid manufacturers in preparing and distributing films for use in foreign markets. This board will supervise film production and advise manufacturers as to the needs of the various foreign fields.

The Patent Convention

After having reviewed the arguments for and against the revival of the Patent Convention with Germany, the State Department is understood to be inclined to revive the treaty under the authority conferred by the Senate.

Some Machine Tool Manufacturing Statistics

When the 1919 census was taken, there were 403 establishments in the United States engaged in the manufacture of machine tools. The aggregate horsepower employed in this industry is given in a special report by the Bureau of the Census, made for the Senate Finance Committee, as being 100,433. These plants employ 132 steam engines developing 20,305 hp.; 17 steam turbines, developing 6,650 hp.; 55 internal combustion engines, developing 2,249 hp.; 16 water wheels, developing 1,033 hp.; 11,408 electric motors, developing 98,817 hp.

The capital employed by concerns engaged in the manufacture of machine tools is given as being $231,039,843. Salary and wage payments in 1919 totaled $84,216,825. The value of products was $212,400,158. There were 8,519 officers, superintendents, managers and other salaried employees. The average number of wage earners employed was 53,111.

Compulsory Patent Bill To Be Re-Drafted

Such determination against compulsory working of patents was brought forward at the initial hearing on that subject that Senator Stanley determined to re-draft his bill. He expects to eliminate the five- and two-year limitations and change his bill so as to prescribe that patents shall be worked within a reasonable time, to be determined by the Commissioner of Patents.

Thomas E. Robertson, commissioner of patents, declared his unalterable opposition to a working clause, because he believes it is imperative that the patentee have a monopoly. It is necessary, he said, to encourage invention and also is necessary to make the patent readily saleable. A working clause, he declared, would discriminate greatly against the small inventor. He pointed out that the term of patents was changed from fourteen to seventeen years because it was shown that profits accrued mainly in the latter part of the term.

It was pointed out at the hearing that a large number of patents are taken out for protective purposes only during the research period. For that reason, it was held that compulsory production would have the effect of giving a body blow to all research.

Frederick P. Fish, widely known patent attorney, of Boston, and A. C. Oliphant, of the Federated American Engineering Societies, were among those who appeared against the bill.

The position of the Secretary of War and of the Ordnance Department was that the national defense is involved in the matter of patents, particularly when foreigners are not required to manufacture in this country.

The Trend of Business Improvement—Plants Resuming

The Motor Wheel Corporation has increased production to capacity at its pressed steel wheel plant at Lansing, Mich., with the adoption of night shifts in several departments at the main works. The Gier plant of the company is operating at full capacity for the first time in the past eighteen months.

The Ford Motor Co. has resumed operations at its branch plant at Atlanta, Ga., following an idle period of about a year. Employment is being given to 300 men, and this force will be increased at an early date.

The Virginia Bridge and Iron Works, Roanoke, Va., is arranging for the immediate reopening of the plant of the Birmingham Steel Corporation, Birmingham, Ala., recently purchased at a Federal receiver's sale. Different departments will be remodeled and improved, and necessary equipment installed. A large portion of the works will be adapted to railroad car repair work, and the remainder given over to structural steel fabrication for buildings and bridges.

The Lansing Foundry Co., Lansing, Mich., has adopted a full time, full production schedule, with employment of additional men. A large order has been secured for parts for the Maxwell automobile, as well as for castings for the Erd Motor Co., Saginaw, Mich.

The American Bridge Co. has resumed operations at its plant at Trenton, N. J., which has practically been closed for the past year. Employment is being given to about 200 men, and this force will be increased to a quota of from 400 to 450 by the close of May.

The Ryan-Bohn Foundry Co., Lansing, Mich., is increasing its working force of coremakers and molders, and has adopted a capacity operating schedule. The company has secured large orders for automobile engine castings for the Continental Motors Corporation.

The East Penn Foundry Co., Macungie, Pa., has increased the wages of coremakers, molders and other foundrymen, 10 per cent. Full production is being maintained under regular operating schedule.

The New York Central Railroad Co. has reopened its locomotive and car repair shops at West Albany, N. Y., Avis, Pa., and Collinwood, Ohio, giving employment to about 775 men on a piecework basis, under increased wage scale of 25 per cent. The West Albany shops will operate with 500 men, the Avis shops with 175, and the Collinwood shops with 100 men.

The Western Maryland Railway Co. is arranging for the immediate resumption of operations at its Ridgeley, W. Va., shops. Work will be devoted to the repair of steel cars. The shops at Fairfax and Elkins, Md., will also be operated.

The Atlas Drop Forge Co., Lansing, Mich., has adopted an overtime schedule in a number of departments at its plant. Operations are on a capacity basis throughout the works, and orders on hand insure production at this rate for a number of months to come.

The Ames Shovel and Tool Co. has resumed operations at its Elwood, Ind., plant, giving employment to about 300 men.

The Willys-Overland Co., Toledo, Ohio, has increased production at its plant, with operations on a basis of 500 automobiles a day. April sales have broken previous records.

The Galveston, Harrisburg & San Antonio Railroad Co. is increasing operations at its car and locomotive shops at El Paso, Tex., and has authorized an immediate call for bids for the construction of a new machine shop at this works, to cost about $200,000, including equipment.

The Hayes-Ionia Co., Ionia, Mich., manufacturer of automobile bodies, has reopened its plant for the manufacture of bodies for the Olds and Reo automobiles, following a shut down for several months past. Employment will be given to about 300 men.

The Hendee Manufacturing Co., Springfield, Mass., manufacturer of motorcycles, has adopted an overtime schedule in two departments, and is increasing the working force throughout the plant. April production ran to 1,400 machines, or more than double the output of January and February.

For several weeks past the Stewart-Warner Speedometer Corporation, Chicago, Ill., has added to its working force at the rate of from 250 to 300 employees a week. Operations have been increased over 300 per cent as compared with this time a year ago. Manufacture is commencing on a number of new automobile specialties, including spotlights and gasoline meters.

The Continental Motors Corporation has adopted a night shift of 500 men at its plant at Muskegon, Mich., working on a large order for motors for the Durant Motor Co. Operations are being advanced at the Detroit plant, which is now giving employment to 1,800 men, or 50 per cent more than at this same time a year ago.

The McCord Manufacturing Co., Chicago, Ill., manufacturer of automobile radiators, gaskets, etc., is increasing production at its Racine, Wis., plant, and will place a full time, full capacity schedule in operation early in May. Manufacture is also being advanced at other plants of the company.

The American Car and Foundry Co. is advancing the production schedule and increasing the working force at its plant at Jeffersonville, Ind. Orders on hand insure continuous operation for the balance of the year. Recent assignments for the plant include 24 cars for the Louisville & Nashville Railroad; 15 cars for the Interstate Public Service Co., Indianapolis; 50 cars for the Chicago & Northwestern Railroad; and repairs to 25 passenger cars for the New York Central Lines.

The Duplex Printing Press Co., Battle Creek, Mich., is increasing operations at its plant and plans for early enlargements for greater capacity. It is proposed to double the present facilities of the foundry and machine shop, and about $750,000 will be expended for buildings and equipment. The line of production will be extended to include printing presses and parts for catalog and magazine work.

C. A. McCune New President of Welding Society

The annual meeting of the American Welding Society was held in the Engineering Societies Building, New York City, from April 26 to 29. The program included the reading of papers on welding and related subjects, and a series of discussions on the adoption of standard specifications and codes. At the technical session of the meeting three interesting papers were read. They were: "Welding of Heavy Copper Plate," by A. S. Kinsey; "Electric Welding of Dredge Pipes," by J. H. Nead and R. L. Kenyon; "Thermit Welding," by J. H. Deppeler. Separate sessions were held on electric-arc and gas welding. The committee on training of operators reported considerable progress along these lines and was authorized to continue its work during the next year.

The election of officers resulted in the selection of Charles A. McCune, of the Page Steel and Wire Co., Bridgeport, Conn., as president; W. H. Namack, of Ballston Spa., N. Y., vice-president for the New York and New England district; T. T. Oechsle, Philadelphia, Pa., vice-president for the middle Eastern district; W. A. Slack, Chicago, vice-president for the middle Western district. Directors elected were: James Burke, Erie, Pa.; Herman Lemp, Erie, Pa.; H. I. Walsh, Newport News, Va.; A. F. Jenkins, Baltimore, Md.

In recognition of his services to the welding industry and to the society, the members elected Comfort A. Adams to honorary membership in the American Welding Society. Mr. Adams was the founder of this society and has been instrumental in bringing it to its present state of success. The society also conferred this honor upon Edmond Fouché, of Paris, who is credited with being the first to see the possibilities of gas-torch welding.

N. Y. State Scholarships for Technologists

The University of the State of New York is offering twenty-five scholarships to trade and technically trained persons who desire to prepare themselves for teaching. Persons selected to hold these scholarships, who satisfactorily complete the prescribed one-year industrial teacher training course, are licensed for life to teach their specific occupations in the vocational schools of the State. The salaries range from $1,800 to $3,500 per year. Applications can be obtained from the Division of Vocational and Extension Education, State Department of Education, Albany, N. Y.

Applicants for appointment to the industrial teachers' scholarship must possess some of the following qualifications: Trade, industrial or technical experience; a good general education; must be of good moral character, possess good health, and be a citizen of the United States.

The twenty-five scholarships which will be awarded to qualified persons in 1922 are distributed among the electrical, machine shop, automobile repairing, machine drafting and designing, architectural drafting, printing, textile working and a few other trades.

Business Conditions in England

BY OUR LONDON CORRESPONDENT

Were it not for the unfortunate dispute between employer and employed in the engineering industry, it would be possible to report a marked improvement in conditions economic and industrial. During the past few weeks London has been steadily growing more cheerful, and such headings as "industrials firm," "rubber brighter," "oils rising," "mines more active," and so on, have been fairly common in the financial journals. Money is plentiful and gilt-edged securities have appreciated markedly. To take an outstanding example, the 5 per cent war loan, issued at 95 and for a long time well below that figure, has lately risen to 100. Of course there is a reverse side, as cheaper money suggests bad trade and consequent restriction of the ordinary avenues of investment. Anyway, money is cheaper and this fact and the reduction offered during the course of months in the floating debt have caused the value of gilt-edged securities to rise. It was anticipated with confidence a week or two ago that the bank rate would be lowered to 4 per cent; even now it is held that the reduction is merely postponed for a short time. But in this matter New York sets the fashion and the bank rate here follows.

Imports and Exports Gain

The returns of overseas trading during March showed in imports (total £87,879,424) an increase of 18¼ million pounds as compared with the previous month, though more than 5¾ millions less than March of last year. Similarly, British and Irish exports (total £64,580,793) showed an increase of about 6¼ millions over the previous month, but about 2¼ million pounds less than March, 1921. Re-exported goods (total £10,153,612) were at about the same value as the previous month, and about 1¼ millions more than in March, 1921.

That conditions are improving is shown by the steady decline in the numbers of unemployed officially registered. The fall is more than 192,000 in the last twelve weeks. But here the engineering dispute is beginning to have effect, though the men locked out are not registered as unemployed or they would swamp the improvement. We still have some 1,742,517 persons officially known to be out of work, excluding work-people on short time. Lancashire has been negotiating for some time over a reduction in wages and meanwhile reports less unemployment than for months, while generally speaking the business outlook is regarded as brighter. More people are being employed in coal mining; here the unemployed percentage is among the lowest in the manufacturing and producing industries. In the iron and steel trades the engineering dispute blocks progress where a steady expansion had been anticipated. It is to be understood that in engineering generally not all the shops are closed; those firms that are outside the employers federation are still running, and in the others, pending negotiations, the lockout notices to semi- and un-skilled workers are postponed.

The electrical side of engineering remains fairly well employed, and this is true of textile machinists, though in the process of time the pressure has eased somewhat. The locomotive shops are dull, but, while orders for British lines are still in abeyance, it is publicly stated that contracts with Roumania to the extent of £5,000,000 are being negotiated, though how the financial problems attendant are to be solved has not been made clear. As to motor car firms, those on the light side remain the better employed, in fact the popularity of the light car increases.

The flying machine side of affairs has lately been given an impetus by the increase in the commercial services, particularly between London and Paris. But the unfortunate collision in France has acted as a damper. To revive our spirits and increase confidence we are being reminded that from the beginning of civil aviation in 1919 to the end of last September, according to the Air Ministry, only twelve persons were killed out of 142,241 passengers carried by air; in fact until this last accident there has been no injury in the British services for more than twelve months.

Llyod's Register returns for the last quarter show that we have about 2,236,000 tons of shipping under construction; a reduction in the quarter of about 404,000 tons: deducting vessels on which work has been suspended, apart from the shipbuilding workers' wage dispute, the tonnage actually under construction amounts to about 1,443,000 tons, the decrease applying to most countries.

At the final accounting the national revenue for the year ending with March last showed a balance over expenditure of about 46 million pounds, the revenue amounting to £1,124,879,873 and expenditure to £1,079,186,637. The surplus was considerably below the sum estimated originally, expenditure having been swollen in various supplementary ways, not foreseen when the budget was introduced. Again, the surplus is not entirely due to taxation, for the special receipts amount to more than 170 millions, partly received from Germany on account of the army of occupation and largely arising from the sale of government stores, which, even if properly regarded as revenue, which is doubtful, cannot be repeated next year.

Electric Industry Booming

The war undoubtedly set a number of engineering concerns on their feet again, this applying to mechanical engineers who were able to adapt themselves to the requirements of the moment. The effect on the heavier electrical side was very evident. Here Great Britian had a considerable number of firms none of whom were able to pay large profits, at any rate before the war. Now most of them appear to be in a stable condition, with credits beyond anything they were accustomed to in the past. Thus the Brush Electrical Engineering Co., which has of late been a good customer to machine tool firms for fairly heavy tools needed in the construction of the Ljungstrom steam turbine, at its latest meeting reported a profit, after deducting debenture interest, management expenses and maintenance but not depreciation of £230,557, an increase on the year of about £41,500. Metropolitan-Vickers Electrical Co., formerly known as the British Westinghouse Co., made a profit of £440,300, or about $38,000 greater than was reported for the last year. Stock of materials in hand, work, etc. in progress (less receipts on account) are estimated at just short of two million pounds, comparing with more than 2¾ millions in 1920.

The 1921 outputs were records, both for the Brush and the Metropolitan-Vickers Co. The Edinburgh firm of Bruce, Peebles & Co. paid 15 per cent, and Mather & Platt, Ltd., which is concerned with machinery for the textile industry, paid the same dividend as a year ago but carried forward a larger sum. Other electrical concerns might be noted as paying good dividends, and the cable companies have done well. But there is one marked exception in the electrical field, namely the Edison-Swan Co., which reports a loss of £344,730, for which the coal strike last year is held to be largely responsible. It may be added that £346,445 has been written off for depreciation of stock, and this item in itself more than accounts for the loss.

Some Profits Lower

Turning to the larger mechanical engineering firms, the balance sheet of Cammell, Laird & Co., Birkenhead, Sheffield, etc., indicates a net profit for last year of £170,487; this is more than £90,000 lower than the net profit for the year previous and about £132,500 less than the net profit for 1919. According to the present balance sheet the stock in trade and work in progress are valued at £1,691,148, or not much more than half the corresponding figure at the end of 1920. Armstrong, Whitworth & Co., Ltd., paid 5 per cent on last year's business compared with 10 per cent the year previous; and Craven Bros., South Reddish, makers of machine tools and cranes, paid 7½ per cent on ordinary shares last year.

The prospects of engineering as a sectional interest have certainly been improved as the result of the operations of the Trade Facilities Act, under which the government gives guarantees to enable development schemes to be undertaken. London will benefit by the establishment of a ship-repairing works, etc., on the Thames, by Harland & Wolff, Ltd., nearly 1½ millions having been guaranteed to the firm for this purpose and for certain constructional work in the Glasgow area. Then five millions, repayable as the principal and interest over fifty years, will be devoted to the enlargement of the South London tube, the first of the underground electric railways, and to an extension of another London line. Also 6½ millions for 25 years will be available for the electrification of suburban sections of one of the main London railway lines. Sums have been made available for an electrical generating plant for India and certain English districts, and shipbuilding, steam engineering, dock and harbor work, sewage systems, quarries and the manufacture of folding boxes, all are to benefit.

Detroit Letter

Unemployment in the industrial plants of Detroit seems to be at an end. The Employers' Association has estimated that 45,000 men have been put back to work since October of last year. The latest returns show that about 4,500 men were re-employed during the week ending April 18. Most of the firms are working on full time. There seems to be a shortage of skilled workers.

Inquiries of quality are more generally active in this city than they have been for some time past. An encouraging number of orders has been placed and one dealer said that if he does as well during the next three-fourths of 1922 as he has during the first quarter, his sales will equal in volume the best pre-war year. This does not mean, however, that as many machines have been sold, because prices are higher. Nor does it mean that as much profit has been made, because a much larger organization has done the selling. The sales office is larger and expenses are larger in proportion. The outlook is that sales will be even better during the remainder of the year.

Sales now being made indicate that manufacturers are looking for machines that will cut production costs. Standard machines seem to have a better market. Another large manufacturer of machine tools reports that February was better than any one of the fourteen months preceding and that March was better than February. The outlook for April, so far, shows a further increase. In making this statement the manufacturer referred only to small tools and gages, but added that they are a good barometer and presage similar improvement in larger tools. At any rate they show current activities that could not be construed in any but a favorable light.

The stimulating effect of the radio craze during the past three months has been directly productive of sales. Manufacturers of radio apparatus are all working their plants on double shifts and still cannot fill orders which continue to pour in. Detroit seems to have become overnight the hub of radio activities in the United States.

Syracuse and Buffalo Letter

There seems to be no question as to business having turned the corner and being on the up grade. In Syracuse, for example, every machinery man agrees that business is decidedly better than it was. This is not false optimism, but the calm judgment of hard-headed business men who have fought their way through the past two years.

Machine supplies are in greater demand, showing that they are being used up; also that small dealers are replenishing stocks. Machine builders find more demand for repair parts, indicating that machines are being used once more. Each month shows an improvement over the previous one.

One interesting case is that of the Carhart Bros. foundry. This company took hold of a business just as the slump hit its worst blow and many feared disaster. But the firm brought an experience from a bigger business which helped it weather the storm and come through with flying colors.

The managers prepared an advertising campaign in the local papers and stuck to it persistently and continuously. They varied the spaces from a quarter page down, in the best daily—for it is a local business. But every issue kept the users of castings in and around Syracuse informed as to where they could get good castings. And the company got orders. Other methods of publicity were also used and the total net result is to find Carhart Bros. firmly established and looking forward to the gradually improving business conditions with a smile. It is worthing thinking over.

Buffalo has a number of bright spots in the way of business revival. The American Radiator Co. is very busy as a result of building activities. The Federal Telegraph and Telephone Co. is busy in common with other manufacturers of radio apparatus.

Perhaps the best positive proof of improved conditions is the discontinuation of the form of relief known as the bread line—which had been necessary up to the present. Another sure sign is the fact that men are in demand, good tool makers and others being hard to find. The Pierce-Arrow Motor Co. is included in the general improvement, although handicapped by the effects of a recent regime of efficiency management experts who left a trail of heavy deficits for the year 1921.

The industries which have to do with railway equipment are improving decidedly. Pratt & Letchworth and others report more orders and greater efficiency in operation. They are very sanguine as to the future of 1922.

Cincinnati Letter

The machine tool and general machinery business in Cincinnati seems to be looking up. Orders are being received by local plants from all parts of the country. One manufacturer reports that he has received a number of orders by wire, which indicates to him that shops are in need of certain classes of equipment and that they are in a great hurry to supply the demand for their product. A foundry supply concern reports that the business for the first three months of this year was 30 per cent greater than for the same period in 1921. The Fulflo Specialties Co., of Blanchester, reports that business is very good and that it has received an order from a large automobile manufacturer for a quantity of pumps. R. K. LeBlond has become the head of a realty corporation that will finance the construction of buildings for industrial purposes. The organization is capitalized at $1,000,000. Part of the assets will be the land and buildings on Reading Road and Morgan St., which is now occupied in part by the De Haven Ice Cream Co.; another tract will be the holding at Fourth and Sycamore Sts., to be occupied in part by the Southern Railroad Company's offices.

The factories across the river, which have been guarded by troops during the last three months while the strike of employees was in progress, are reporting that they are continually taking on more help and that several new departments have been started. It is intimated that the militia will soon be withdrawn. Employment in the machinery trade is improving, as the daily papers have carried advertisements at various times during the week for machinists and skilled workers.

Chicago Letter

The change that has taken place in the local machine tool market is not merely one of sentiment but a number of orders have actually been booked. It is true that sales are still relatively insignificant and greatly outnumbered by inquiries and this is one of the things which has made the sentiment more optimistic. There is also a feeling that much progress is being made in the direction of an industrial revival, shown strongly in the building industry, and that it is only a question of time when increased shop activities will be felt in purchases of equipment. Many local shops have already increased their working percentage and several of them find a scarcity of labor. This is particularly noticed in the vicinity of steel plants in this district and also in the building industry.

Several of the machine tool dealers report a few fairly good size orders, but in general the orders booked are small, principally for single machines. The demand is widespread and there is a noticeable improvement in collections.

The Santa Fe Railroad has again made additional inquiries and has placed a few orders for new equipment. The other railroads are still among the expectations of the tool dealers. Activities, after a dull period of a few weeks, are again in evidence in the railroad car buying. The Wabash has contracted for approximately $1,000,000 worth of new passenger equipment, including twenty-four all steel passenger cars, the latest type and design, consisting of eight coaches, nine chair cars, four dining cars and two club chair cars. The American Car and Foundry Co. has the contract for the construction of the equipment. It is understood that equipment purchases aggregating approximately $3,250,000 is to be made within the next few weeks by the Northern Pacific Railway Co.

Judge E. H. Gary, chairman of the board of directors of the United States Steel Corporation, recently made an announcement that a $15,000,000 plant for the manufacture of lap and butt weld tubes is to be erected at Gary, Ind., by the National Tube Co., a subsidiary of the steel corporation.

Birmingham Letter

The consensus of opinion among Birmingham manufacturers seems to be that business is improving. The steel plants and other manufacturing establishments are fairly busy, though not running up to capacity. The most important event here during the week was the convention of the Southern Supply and Machinery Dealers Association. Several hundred dealers and manufacturers of mill supplies were in attendance and all expressed optimism in the future of Southern industries.

The Walraven Co., at Atlanta, agents for Brown & Sharpe, Hendey, Bullard, Gray, Heald, and a few others, report business quiet but are making some sales of tools to railroad shops and garages. They report that there is a slight improvement, and that the majority of good second-hand tools has been worked off. The Seeger Machinery Co., Atlanta, reports that its sales are equal to those of 1913-14. This concern is the agent for Cincinnati milling machines and for Landis grinders.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

Prof. Lionel D. Edie of Colgate University recently published a book called "Principles of the New Economics" that ought to be read by all business men. In the first chapter upon "The Significance of Psychology in Economics" he says, "Men are bundles of tendencies to act. Whether in the banker's office or around the directors' table or on the salesman's route or at the worker's machine, men are aggregates of urges to act in certain directions."

The truth of this statement was aptly exemplified in the financial markets last week. There is hardly a precedent in peace times for the concatenation of disturbing events that business had to face.

With Lloyd George predicting that war might be a consequence, the disruption of the Genoa Conference more than once seemed imminent. A bonus bill that will sooner or later involve the distribution of four or five billion dollars among our ex-soldiers seemed more certain of passage than at any time previously. No progress toward the settlement of the coal strike was made and from New England it was reported that some of the textile strikers were resorting to bomb throwing and sabotage.

In China three military leaders are contending for the mastery of the country and an internecine war is threatening.

Floods in the Mississippi Valley and Texas have already caused much loss and unseasonable weather has delayed agricultural work throughout the country.

Speculation Rife

None of these things nor the warning against the excessive use of credit for speculative purposes, issued by the Comptroller of the Currency, Mr. Crissinger, seem to have had the slightest effect upon the "urge" to invest or buy something by which so many men now seem possessed. On Tuesday last new bond issues amounting to over $186,000,000 were offered and sold in the New York market. They included $45,000,000 New York City bonds which were bought on a 4.12 per cent basis and are being resold to the public at a price which yields only 4.06 per cent.

Total offerings for the week were probably in excess of $300,000,000 and many other large issues are being planned for. Liberty Bonds have moved upward again to a parity with the basis upon which the New York City bonds were sold and most other securities upon which a fixed return is assured have been corespondingly firm.

This extraordinary demand for investments is, of course, primarily due to the ease of money, but it also reflects a widespread confidence in the future that is the more impressive because it refuses to be shaken by untoward developments that would be almost paralizing if the psychological attitude of the community was less stubbornly optimistic than it is.

This being the case it is reasonable to assume that the upward movement will re-assert itself whenever the influences which now restrain it cease to be operative and as strikes must ultimately be settled and order has always been brought out of disorder in the past the probabilities seem to indicate that the "urge" to buy will outweigh the desire to sell for some time yet. The result will be rising prices, for the market tendency is frequently determined by a very slight preponderance of demand or offerings and in the present case it seems likely that with any encouragement the buyers will largely outnumber the sellers.

Gold Reserve Gains

This view is reinforced by the statement of the Federal Reserve System which shows a further addition of $4,300,000 to the gold held and a gain of 1 per cent in the reserve ratio which now stands at 78.3 per cent. This is all the more surprising as most stock brokers are increasing their loans and the only explanation suggested is that merchants are borrowing less because they are allowing their stocks to run down. If this be true the jobbers' trade should soon be better, for the money realized from the tremendous bond issues recently sold must soon find its way into circulation and increase the purchasing power of the wage earners.

From Youngstown, Hammond and other steel manufacturing centers it is reported that "Help Wanted" notices are to be seen for the first time in many months, and except in the coal mines and cotton mills there is certainly less unemployment than there was. In the building trade, which is becoming exceptionally active everywhere, there is a great scarcity of skilled mechanics, and in New York contractors are outbidding the union wage scale.

The commodity markets show but few important changes. Cotton has been somewhat firmer on the flood news but overflow years are not as a rule short crop years and those who were counting upon a comparatively small gain in acreage have been slightly shocked by a private estimate which puts the increase at 19 per cent. Confidence in an enlarged export demand for cotton has also been somewhat disturbed by developments at Genoa. The other textiles, wool, silk, flax and jute, have been firm, though trading is somewhat restrained by tariff uncertainties.

Sterling exchange has been remarkably steady despite the turbulence at Genoa, but francs and lire have been rather easier and marks went back to 35 cents a 100 after having advanced to 43 cents upon the theory that Mr. Morgan's promised attendance at a financial conference to be held in Europe meant that he would undertake to float a German loan here. Such a loan might find a few buyers here but it is to be doubted whether it would be generally taken.

The stock market has not been quite as strong as the bond market and in the industrial department some declines have been registered from time to time, but railroad shares have not yielded appreciably. The Lake Erie & Western Railroad, formerly owned by the New York Central, has been sold to interests which recently purchased the Toledo, St. Louis & Western, and the Interstate Commerce Commission has arranged for an open conference at which the railroad executives will have opportunity to discuss the consolidations for which the Esch-Cummins bill provides. These are but precursors of the many railway combinations that are believed by some to be inevitable and in their consideration many properties are likely to develop elements of value not previously discerned.

Economy Necessary

The result may be a great speculative movement in the railway stocks which represent the control of our greatest industry and if it does the resulting increase in their asset value will so enlarge the basis of credit that a marked expansion of business generally will be almost certain to follow.

But we must not deceive ourselves. It is upon psychological rather than material conditions that we must rely for the stimulated activity that seems to be ahead of us. Real prosperity is the product of hard work and political as well as individual economy. Until Congress appreciates the truth of this aphorism and applies it wise men will watch carefully for any signs of change in the prevailing sentiment.

It is to be admitted that there is but little indication of any change as yet, for the possibilities of "gold inflation" which have been so frequently pointed out in these letters are now beginning to dawn upon the popular mind. As an example of this one financial writer has recently stated that an aggregate expansion of about four billion dollars in the loans and circulation of the Federal Reserve Banks is now possible without reducing the reserve ratio below the 40 per cent which is generally and erroneously assumed to be the legal minimum. The calculation is probably misleading but it has powerfully impressed the public imagination and may ultimately give currency to the idea that credit is inexhaustible, which is one of the dangerous hallucinations by which men become obsessed in times of speculative excitement.

Industrial Engineers Hold Eighth Convention in Detroit

The eighth national convention of the Society of Industrial Engineers was held in the Hotel Statler, Detroit, Mich., April 26 to 28. The major subject of the meeting was "The Influence of Industrial Engineering Upon the Earnings of Capital and Labor." The meetings were held in the afternoons and evenings; the mornings were devoted to inspection trips to several of the large manufacturing plants in Detroit and nearby cities. Some of the plants visited were: Ford Motor Co., Detroit Steel Castings Co., Caddilac Motor Car Co., Detroit Pressed Steel Co., Burroughs Adding Machine Co. and the Hudson Motor Car Co. Joseph W. Roe, president of the society, presided over the technical sessions.

The meeting on Wednesday evening was presided over by Mortimer E. Cooley, president of the F. A. E. S. and Dean of the College of Engineering, University of Michigan. E. W. Hulet, vice-president of the White Motor Co., Cleveland, talked on "How Industrial Engineering May Serve the Executive," and illustrated his remarks with lantern slides.

"How Industrial Engineering Serves the Factory Manager," by Carl Wennerlund, of Detroit, introduced some new phases of industrial management. Mr. Wennerlund traced the development of industrial engineering during the past few years and interpreted its influence on industry. His remarks covered the progress of factory staff duties, tool designing, strengthening of belting and machines, speeding up of line shafts and an increase of bearing areas. In speaking of wage incentives whereby workmen would be promoted in proportion to their productive capacities, he said that it had been found advantageous to handle production so that a workman's efforts would be coordinated to the best advantage of all concerned. After much of the purely physical work in factories had been done it was clear that some attention should be paid to the human element. He advocated the selection of employees with some view as to their moral, physical and vocational fitness. The great influence of the industrial engineer lies in the fact that he has taken one subject, thoroughly analyzed it, and has pointed out certain methods of procedure in order that better production could be obtained. This led to the development of that great subject known as "motion study" which has become the basis for setting wage incentives and which has been adopted in principle by manufacturing concerns everywhere. Mr. Wennerlund followed these remarks with a résumé of methods by which every class of work done in the General Motors plants is in charge of an expert, and all these activities are tied together under one staff director, so that all can co-ordinate in and follow the same policy.

Fred M. Sawin, of the Federal Rubber Co., offered some added suggestions to the above remarks. He explained a plan whereby each general foreman, foreman, and assistant foreman receives, in addition to his regular salary, a bonus based on the following factors: percentage of seconds; cost of repairs to product; percentage of waste; departmental unit cost of product; amount of power used and direct overhead cost. He said that in the first year in which this plan was used the saving over the previous year amounted to over $400,000.

At another session Robert B. Locke, director and manager of the Federal Reserve Bank, Detroit, spoke on "The Need of the Hour." In the course of his remarks he said: "No sense of justice can be expected in working men until they are drilled in the fundamental economic principles underlying all business relations. The most drastic statutes will not cure the strike plague, but widespread instruction in economics will. This is an age of propaganda; many of us are unaware of its tendencies or its magnitude. A great deal of it is founded on economic fallacy. Therefore, I repeat that business should take an active interest in the character of today's tidal wave of propaganda.

Progress From Toil

"To stem the tide of discontent there is necessary a campaign of education, which will show the rising generation that America has gained everything that revolution can possibly bring, that there are certain boundaries beyond which the race cannot pass, and immutable laws of economics which no radical upheaval can alter. Neither the idle rich nor the shiftless poor can make secure the future of any state. Progress must come from those who toil intelligently and who receive therefrom character-building development. It is this class that gives to democracy the best guarantee of safety, and this class must not be oppressed either from above or below."

Dr. Yoichi Uyeno, chief director of the Institute of Industrial Psychology, Tokyo, Japan, told of his experience in applying scientific management in the factories of Japan. He said that after thorough research the hours of work were reduced and rest periods made available to the workers in the forenoon and afternoon. Working on the theory that every individual has a natural rate of speed, workers were arranged in groups in which members all worked at approximately the same rate of speed. This developed the instinct of rivalry between groups and resulted in an increased production of 35 per cent.

Henry C. Link, author and employment psychologist, started a heated discussion when he declared that "Judging a man by his face or his handwriting is nonsense." This remark was taken up by Harrington Emerson, of New York, who characterized Mr. Link's remark as "absurd." Mr. Emerson's views were supported by John Calder, superintendent of industrial relations, Swift & Co., Chicago. Mr. Calder went into considerable detail in justifying his stand on the question. He related some of his experiences with help in the packing plants of the Swift company.

Other speakers were: E. T. Miller, United Typothetae of America; W. W. Gilgis, the Palmolive Co.; W. P. Hilton, Willys-Overland Co.; Mathew Woll, vice-president of the American Federation of Labor; L. Morehouse, Detroit Pressed Steel Co.; F. H. Lowe, Ford Motor Co.; A. S. Cunningham, Hadfield-Penfield Steel Co.; Sam Lewisohn, of New York; F. B. Gilbreth, of Montclair, N. J.; N. A. Hawkins, of Detroit; and D. B. Gauschet, of Chicago.

Esthonia a Market for American Agricultural Machinery

Esthonia is a country which is well worth the careful attention of American manufacturers and exporters of agricultural machinery. It is primarily an agricultural country, and over two-thirds of its population are dependent on agriculture for a livelihood. The farmers are generally of a high degree of literacy and intelligent and progressive. There are sixteen agricultural schools in the country, which serve to spread broadcast knowledge and understanding of modern methods of farming. The numerous agricultural societies which exist in Esthonia have also had much to do with spreading the knowledge of modern agriculture possessed by the farmers, and for the past decade, through local farmers' associations, numbering 130, the use of fertilizers, agricultural machinery, and other things of economic value has become general.

A serious lack of agricultural machines exists in the country at the present time. This has resulted from the stoppage of imports during the war and during the period of reorganization following the war.

A. S. M. E. To Consider Power Test Codes

On Tuesday morning of the spring meeting of the American Society of Mechanical Engineers (Atlanta, Ga., May 8 to 12) a public hearing is set for the discussion of the three additional power test codes which have reached this stage of their development during the past year. Last May at Chicago the committee, of which Fred R. Low is chairman, presented codes on general instructions, steam engines, and evaporating apparatus. It now presents codes on definitions and values, displacement compressors and blowers, and hydraulic power plants.

Though these codes have passed six successive revisions in reaching their present form, the committee will welcome a full and frank discussion by the members of the society and others interested in these subjects. Reprints of all three codes, revised to date, have been prepared by the committee and may be obtained by addressing C. B. LePage, secretary, at the society's headquarters.

Adams Demonstration in June

The third annual machinery demonstration by Ogden R. Adams, Central Ave. at St. Paul St., Rochester, N. Y., will be held on Friday and Saturday, June 2 and 3. This year two days will be given to the demonstration which promises to be on a larger and more diversified scale than heretofore. Manufacturers and technical experts from various parts of the country will be present to demonstrate their products. Other unusual and interesting features will be presented to make the two days most helpful and entertaining to all who attend.

Professor Moore Explains Latest Theory on Endurance of Steel

At a meeting of the New York chapter of the American Society for Steel Treating, held in that city on April 25, Prof. F. H. Moore delivered a lecture on the "Fatigue of Metals." The material for the lecture was taken from a bulletin of the Engineering Experiment Station of the University of Illinois, of which Professor Moore is in charge, and was supplemented by some later developments along the lines suggested in the title.

Professor Moore spoke extemporaneously, giving some interesting details of his recent experiments to establish an endurance limit for steel. His conclusions showed there was a very definite endurance limit for different kinds of steel, subject to stresses of varying magnitude applied under certain conditions. The discussion which followed the professor's address brought out some interesting thought. Further developments along these lines are expected at future meetings of the society.

Steel Treaters Spring Meeting in Pittsburgh

The annual spring meeting of the American Society for Steel Treating will be held in Pittsburgh on May 25 and 26. W. J. Merten, chairman of the meetings committee of the Pittsburgh Chapter of the association, is in charge of the arrangements and has announced a tentative program which embodies some very interesting sessions. The papers which will be presented have been selected from a large assortment of subjects pertinent to the steel treating industry. Some of the papers are: "Fiber in Steel and Iron," by Prof. McIntosh, of the Carnegie Institute of Technology; "Mass Influence on Heat-Treating," by W. D. Crowe, of the Carnegie Steel Co.; "Abrasive Qualities of Carbon in Alloy Steels," by Mr. Cox, of the R. D. Nuttall Co.; "The Importance of Properly Heating and Cooling Steel," by J. A. Succop, of the Heppenstall Forge and Knife Co.; "The Manufacture of Springs," by Mr. Smith, of the Union Spring & Manufacturing Co.; "Shrinkage of High Speed Steel," by Mr. Grossman, of the Electric Alloy Steel Company.

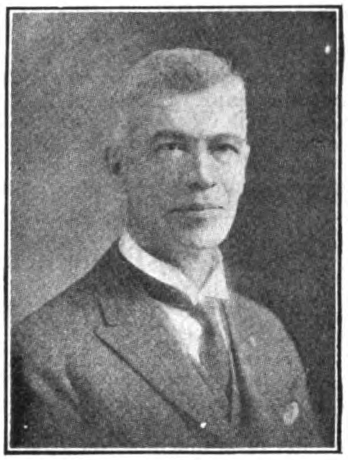
At the annual banquet, which will be held on the evening of the twenty-fifth, the toastmaster will be G. H. Neilson, president of the Braeburn Steel Co. The speakers will be Dr. Bowman, of the University of Pittsburgh; Dr. J. A. Matthews, president of the Crucible Steel Company of America; and Prof. F. Crabtree, chairman of the American Institute of Mining and Metallurgical Engineers, Pittsburgh Division. The theme of the speakers at the banquet will be "Mystery of Metallography and the Heat-Treatment of Iron and Steel." A series of expeditions to the various plants in the vicinity of Pittsburgh has been arranged. The delegates will visit the steel mills and manufacturing plants and will be entertained by the management of several plants in the city.

The meetings will be held in the Auditorium of the Bureau of Mines and the headquarters of the convention will be established there. Further particulars regarding the convention can be had from W. H. Eisenman, national secretary of the society at 4600 Prospect Ave., Cleveland, Ohio.

W. A. Greaves, Machine Tool Builder, Dies in Cincinnati

William A. Greaves, Sr., president of the Greaves Machine Tool Co., Cincinnati, Ohio, died in that city on April 19. He was sixty years old. Mr. Greaves was well known in the machinery building industry.

He was born in Cincinnati and obtained his technical education in the Ohio Mechanics Institute. He served



WILLIAM A. GREAVES, SR.

his apprenticeship with the Lomas Forge and Bridge Co., in Cincinnati, and later became a foreman for Lodge, Barker & Co.

In 1889 he formed a partnership with H. H. Klusman, which was known as the Greaves-Klusman Co. His company manufactured lathes and wood-working machinery. In 1914 the company was incorporated as the Greaves-Klusman Tool Co., and took up the manufacture of lathes exclusively. Mr. Greaves sold out his interest in this concern in 1917, and with his two sons formed a partnership which is now known as the Greaves Machine Tool Co. He was also president of the Western Water Motor Co.

Mr. Greaves had a pleasing personality, and his vocal talent made him a welcome visitor in the social and business circles in which he moved.

Office Managers' Conference

The third national conference of the National Association of Office Managers will be held at Washington, D. C., on May 18, 19 and 20. Headquarters will be in the Hotel Raleigh but the meetings will be held in various government buildings. The registration office will be in the auditorium of the District of Columbia Building.

An unusual program of technical sessions, round table discussions and inspection trips has been prepared by a committee of which Herbert D. Brown, chief of the U. S. Bureau of Efficiency, is chairman. The members and their guests will be presented to President Harding and will hear Secretary of Commerce Hoover in an address on office efficiency.

Manufacturers and Supply Men in Convention at Birmingham

The joint convention of the American Supply and Machinery Manufacturers Association with the Southern Supply and Machinery Dealers Association was held in Birmingham, Ala., April 24 to 26. The convention was well attended by several hundred mill supply men from the Southern and Western territories. A general feeling of business optimism pervaded the meetings and predicted a healty growth in the machinery business during the coming months.

One of the most important addresses of the convention was delivered by Col. Peter O. Knight, well-known Southern jurist and counsel for the Southern Hardware Jobbers Association. Col. Knight's subject was "Optimism." He delivered a scathing denunciation of our present legislative organization, and severely criticized the sixteenth, seventeenth, eighteenth and nineteenth amendments to the constitution of the United States, stating that they were against the principles laid down in the original constitution. He also attacked the method of electing representatives and senators to Congress.

C. H. Houston, Assistant Secretary of Commerce, made a brief address in which he called atention to the closer relations existing between his department and the trade associations of the country. He declared that the department wished to have these relations of such a nature as to be of greater service to business. Other speakers were: W. H. Kettig, chairman of the Birmingham Branch of the Federal Reserve Bank; C. W. Beaver of the Yale & Towne Manufacturing Co., and N. A. Gladding, president of the American Association.

Bosch Service Plan

The American Bosch Magneto Corporation has inaugurated a special service plan which is intended to take care of all Bosch electrical equipment through the 500 or more service stations throughout the country. This service includes the registration directly with the company and its official representatives, as soon as the equipment is put in service. When a car, truck, tractor, engine or other product equipped with Bosch electrical apparatus is sold, the dealer fills out a postcard supplied him for that purpose, and mails it to the American Bosch Magneto Corporation, or one of its branches. Upon the receipt of this card, which contains all the information relative to the sale, the Bosch Corporation registers it and furnishes the purchaser with an identification card which entitles him to free service at any Bosch service station during the guarantee period.

The idea of this plan is to keep all genuine Bosch parts in working condition, and to eliminate the trouble often experienced by users of Bosch equipment in securing service repairs and renewal of parts. This service also keeps the company in close touch with the purchaser during the time of its responsibility to him. It also helps to protect the reputation of the company and its products.

Business Items

The Reeves Pulley Co., Columbus, Ind., announces that the manufacture and sale of Reeves centerless roll grinders is now being carried on at the home plant in Columbus. Agency distribution has been discontinued.

The International Blower Co. has been incorporated at Hartford, Conn., with a capital of $50,000. C. H. Keeny is president. The company has purchased the entire business of the Connecticut Blower Co., of Hartford, including the machinery, tools, stock, equipment, etc., and has moved into its own factory at 345 Trumbull St., Hartford.

At the annual meeting of the directors of the Abrasive Company of America, Ltd., Hamilton, Ontario, the following officers were elected: Louis T. Byers, president; J. H. Byers, vice-president and general manager; L. J. Borris, vice president; S. P. Byers, secretary and treasurer; Frederick S. Dickson, chairman of the board.

The Power Plant Equipment Co., of Kansas City, Mo., has been appointed representative for the Combustion Engineering Corporation, of New York.

The Jones & Fiefield Co. has been organized at Joplin, Mo., and has opened a machine shop at 2330 Baxter Ave.

John L. Taylor, of Philadelphia, dealer in power and contracting equipment, iron and wood-working machinery, announces the removal of his business from the Bulletin Bldg. to 211 North Third St. He would like to hear from manufacturers with agencies open in his lines.

The Reliable Machine Works Co., 1188 Main St., Bridgeport, Conn., recently changed the name of the concern to the Wheeler Insulated Wire Co., and will manufacture insulated wire and products.

The New England Tube and Stamping Co., West Haven, Conn., recently incorporated to take over the business of the Coe-Stapley Manufacturing Corporation, was organized at a recent meeting of the stockholders. P. J. Holdsworth, Gramercy Park, New York, has been elected president; J. M. Harding, New Haven, vice-president; Robert R. Adams, of Bridgeport, secretary and treasurer. Messrs. Holdsworth, Harding and Adams, also constitute the board of directors. The company will manufacture tubing, sheet-metal products and automobile accessories.

The Hat City Foundry Co., of Danbury, Conn., has recently filed incorporation papers, to engage in the foundry business. The capital stock is $15,000, and the incorporators are F. A. Shepard, J. P. Fahey and E. S. Ross, all of Danbury, Conn.

The Bridgeport Brass Foundry, Inc., of Bridgeport, Conn., has filed a preliminary certificate of dissolution with the Secretary of the State of Connecticut, and any claims against the company should be sent to Ralph Johnstone, 530 Newfield Ave., Bridgeport.

The Merwin Screw Co., Inc., Bridgeport, Conn., has recently filed papers of incorporation under the laws of Connecticut, to engage in the manufacture of screws, etc. The capital stock is $10,000, and the incorporators are: Fred H. Merwin, E. W. Merwin and Robert C. Mallette, 884 Main St., Bridgeport, Conn.

The International Tool and Gauge Co., 119 Broad St., Bridgeport, Conn., has recently opened a modern tool, die and gauge shop at the above address.

The W. F. Concannon Shear Co., Inc., of Milford, Conn., manufacturer of steel shears and scissors, recently increased the capital stock of the concern from $20,000 to $50,000.

The Lackawanna Tubes Ltd., recently organized, has taken over the properties and holdings of the Welland Machine and Foundries Ltd. The newly formed company has received authorization for a capitalization of $550,000 and will soon let contract for the construction of a new factory building. L. R. Weeks, of New York, is president and general manager of the company.

L. S. Starrett, Prominent Tool Builder, Dead

Leroy S. Starrett, president of the L. S. Starrett Co., tool manufacturers, Athol, Mass., died at his winter home in St. Petersburg, Fla., on April 23. He was born in China, Me., in 1836, and started his first machine shop in Newburyport, Mass., in 1866, after taking out patents on a washing machine, a butter worker and a meat chopper. Two years later he went to Athol and established the Athol Machine Co. He patented other devices, including a shoe hook fastener and a new type of vise. Suffering reverses, he lost control of the company, but soon afterward

LEROY S. STARRETT

started a new concern, and began to produce the line of tools that has met with marked success.

Gradually he built up a large business and in addition to his control of the L. S. Starrett Co., he regained control of the Athol Machine Co., and also held the dominant interest in the Athol Manufacturing Co. and the Metropolitan Air Goods Co. He founded the Union Twist Drill Co. which has grown to be one of Athol's largest industries. He was active in business up to the beginning of the present year.

Personals

R. L. Foster, manager of the New York sales department of the American Steel and Wire Co., has been appointed assistant general sales agent.

Harrison P. Reed, for many years electrical engineer and more recently head of the elevator department of the Cutler-Hammer Manufacturing Co., of Milwaukee, has been appointed general manager of the A. Kieckhefer Elevator Co., Milwaukee. He will assume his new duties on May 1.

George Powers has resigned after 48 years of continuous service with the Ludlow Valve Manufacturing Co., of Troy, N. Y. He will sail soon for a visit to England. For the past thirty years Mr. Powers has been foreman of the brass foundry.

H. R. Peckins, who for the past several years has represented the Utica Drop Forge and Tool Co., Utica, N. Y., is now associated with the Peck, Stow & Wilcox Company with headquarters in Utica.

W. A. Bachman, formerly vice-president of the Hemp Hills Foundries, Pittsburgh, Pa., has been appointed superintendent of foundries of the New York Central Railroad Co., with headquarters in Frankfort, N. Y.

Benjamin B. Gottesberger, of New York, has been appointed professor of mining at Yale University, New Haven, Conn. Mr. Gottesberger has had considerable mining engineering experience.

Francis H. Sherwood has recently joined the sales division of the Yale & Towne Manufacturing Co., Stamford, Conn. Mr. Sherwood has had 12 years experience in the factory of the company.

Frank L. Eidmann, mechanical engineer of the Barrett-Cravens Co., Chicago, will sail this month for a six-months' business trip through Europe.

J. K. Williams, founder and former president of the Williams Foundry Co., Akron, Ohio, will re-enter the foundry business as vice-president of the Franz Foundry and Machine Co., of Barberton, Ohio.

W. T. Doyle, formerly associated with the S. Freeman Co., boiler manufacturers, of Racine, Wis., is now associated with the Richter Machinery Co., of Milwaukee. He will have charge of the boiler department.

A. S. Duncan, storekeeper at the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Co., has been appointed general storekeeper of finished stocks.

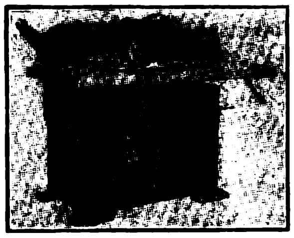
W. H. Miller has been appointed supervisor of tools and gages in the inspection department of the Westinghouse Electric and Manufacturing Co. works at East Pittsburgh, Pa.

E. R. Jackson, who during the war was assistant chief engineer at the Rock Island Arsenal and more recently sales manager for the Helsbels Iowa Co., Davenport, Iowa, has been elected secretary and superintendent of the Square Turn Tractor Co., of Norfolk, Neb.

Condensed-Clipping Index of Equipment

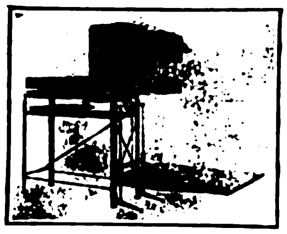
Patented Aug. 20, 1918

Saw, Rip, Wood, Self-Feed, No. 65
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," January 12, 1922



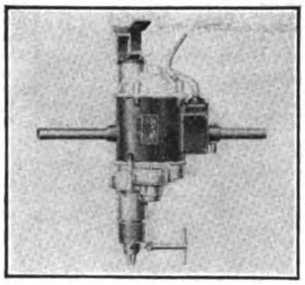
The machine rips all kinds of lumber and handles either rough or finished stock. The in-feed spur roller, either corrugated or smooth, carries the stock across the table top and through the saw. The machine holds saws up to 18 in. in diameter, cuts lumber up to 5 in. thick, and rips up to 24 in. wide. Six saws may be used at one time. There are three rates of feed, 80, 110 and 140 ft. per minute. Equipment: one 16-in. saw, saw guard, feed spur and guard, splitter, one plain and one corrugated sectional out-feed roll, filling collars and sawdust chute. Table 33½ x 56 inches.

Photostat, All-Steel
Photostat Corporation, 299 State St., Rochester, N. Y.
"American Machinist," January 12, 1922



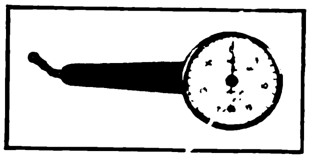
The chief feature of the machine is its all-metal construction. It is made in the same sizes as the former model. Roller bearings are used for the magazine and bellows. The mechanism for elevating and lowering the engineering copyboard or bookholder has been strengthened. A separate developing tank is carried on the side of the machine. All parts of the photostat are protected from splashing chemicals and erosion from the escaping fumes of the chemicals. The knife mechanism for cutting off prints has been strengthened. The adjustable curtain makes the magazine light proof and protects the sensitized paper when the magazine is open.

Drill, Electric, Portable, Universal, "Super"
Hisey-Wolf Machine Co., Cincinnati, Ohio.
"American Machinist," January 12, 1922



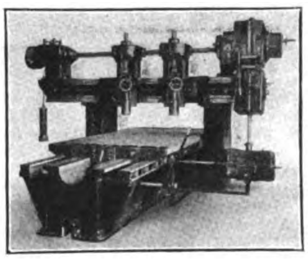
The drill uses either direct- or single-phase alternating current of any frequency from 25 to 60 cycles, and is equipped with ball bearings throughout. It is made in three sizes, with capacities in steel of [illegible], ½ and [illegible] in. It is supplied for 110 or 220 volts, but can be furnished for special voltages up to 250. A Jacobs drill chuck is supplied for holding straight-shank drills. A Morse No. 1 taper socket can be furnished. The drill may be fitted with a screw feed, breast plate, grinding wheel, flexible shaft and a stand. Weight, 18, 22 and 24 lb., respectively.

Indicator, Dial, "Junior"
Atlas Indicator Works, 160 North Wells St., Chicago, Ill.
"American Machinist," January 12, 1922



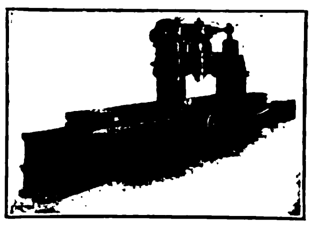
A swiveling clamp mounted on the back of the housing holds the dial in the most convenient position for reading. The indicator dial is graduated to 0.001 in., and has a range of 0.055 in. The position of the contact point can be changed for different sorts of inspecting operations. After adjusting the contact point on the work, the dial may be revolved so as to bring the zero mark in line with the indicator hand.

Milling Machine, Planer-Type, Vertical, Double-spindle
Beaman & Smith Co., Providence, R. I.
"American Machinist," January 19, 1922



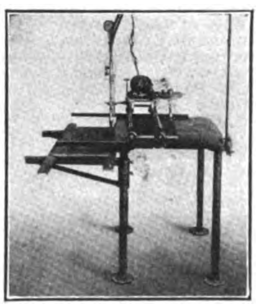
The machine has a fixed cross-rail with two independent heads, each with power feed for separate or simultaneous use. The table has a traverse equal to its length. Power feed from 1 to 8 in. per minute is available for all movements. There is a quick traverse for each movement at constant speed, independent of the feed. Three levers upon the operating side of the machine control all movements. A handwheel on each head provides a vertical spindle movement of 12 in. Inserted-tooth cutters 10 in. in diameter are used. Width between housings, 64 in. Table, 60 x 96 in. Weight, 50,000 lb. Floor space, 11 x 16 ft.

Milling Machine, Planer-Type, Double-spindle, Intermittent Feed
Beaman & Smith Co., Providence, R. I.
"American Machinist," January 19, 1922



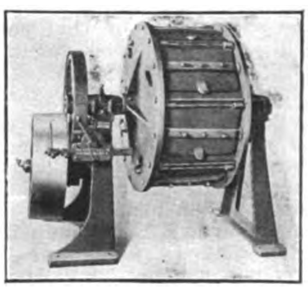
The machine is used for spot milling castings with surfaces in one plane but not continuous. The table power feed covers the full length of travel. The crossrail is fixed and mounted with two vertically adjustable spindles without power movement. The special feature of the machine is the "jump," or intermittent feed controlled by a series of adjustable cam dogs. A gear box provides changes of feed. A pair of three-step cones and belt permits of varying the rate of quick traverse between cuts. The machine can be furnished with dimensions to suit any piece that is to be machined in quantities. Table 24 in. x 14 ft.

Cutting Machine, Oxy-Acetylene, Automatic, "Gewe"
General Welding & Equipment Co., 74 Brookline Ave., Boston, Mass.
"American Machinist," January 19, 1922



The machine cuts metal parts such as dies, cams, crankshafts and drop-forge tools directly from the steel plate. It has two carriages. The upper carriage supports on one side an oxygen-acetylene cutting torch, and on the opposite side the driving and the tracing system. A fiber template with the work outline grooved in it must be used. The speed can be regulated electrically by a rheostat or mechanically by changing the position of the friction wheel on the disk. The torch may be operated on either oxygen and hydrogen, or on oxygen and acetylene. The machine is made in two sizes having capacities of 12 x 12 in. and 24 x 24 in., respectively. Cutting speed, 18 in. per min. for [illegible]-in. stock, to 7 in. per min. for 4-in. stock.

Burnishing Machine, Ball
Abbott Ball Co., Hartford, Conn.
"American Machinist," January 19, 1922



The chief feature of the machine is that the work is held stationary on the inside of the barrel body, and as the barrel rotates the parts are carried through the cleaning mixture without striking against one another. The barrel has eight sides, each having a hand hole with a hinged cover. The packing around the edges of the hinged covers makes the barrel water-tight. The work fixtures are fastened to the inside of the cover plates. Several sets of cover plates and work fixtures are usually provided for each machine.

Clip, paste on 3 x 5-in. cards and file as desired

M. H. ROBERTS has been appointed vice-president in charge of engineering of the Franklin Railway Supply Co., Inc., New York City. He was previously chief engineer.

J. G. WORKER, vice-president and general manager of the Phoenix Manufacturing Co., Eau Claire, Wis., has become president and directing head of that firm, following the resignation of C. L. Tolles.

W. A. THOMAS, former president of the Brier Hill Steel Co. and now a director of the Mansfield Sheet and Tinplate Co., Mansfield, Ohio, has been elected a director of the General Fireproofing Co., succeeding R. M. Thell who continues as secretary and treasurer.

HARRY R. JONES, former president of the United Alloy Steel Corporation and now a member of that corporation's executive board, has been named a director in the Dominion Alloy Steel Corporation, a new $15,000,000 concern to be located at Sarnia, Ontario, Canada.

C. C. LYND, who has been in charge of the New Orleans office of the American Rolling Mill Co., Middletown, Ohio, has been placed in charge of the office which has been opened in Houston, Tex.

WALTER F. ROGERS, formerly with the Norton Company, has joined the sales staff of the Reeves Pulley Co., Columbus, Ind.

JOHN A. JOHNSON, of Chicago, has been appointed works manager for the K & F Manufacturing Co., engineers and tool builders, of Kenosha, Wis.

WALDO M. PITKIN, general manager of Albert Baldwin & Co., Ltd., of New Orleans, La., dealer in hardware and machinery, has been re-elected president of the Southern Hardware Jobbers Association, which has just closed its annual convention. John Donner, of Richmond, Va., secretary-treasurer for the past fifteen years, was again chosen for that office.

WILLIAM J. GRIPPIN, treasurer of the Bilton Machine Tool Co., manufacturers of machinery and tools, Bridgeport, Conn., has been chosen treasurer and a director of the Artistic Bronze Co., bronze manufacturers of Bridgeport, Conn.

HARRY HALSALL, of Atkinson, Haserick & Co., distributors of cotton manufacturing machinery, of Boston, and Bradford, Eng., sailed from this country recently for England, where he plans to spend the next two months on business, both in England and on the continent.

MARK A. MILLER, of the New York office of the Yale & Towne Manufacturing Co., Stamford, Conn., has joined the sales force of that company, and will shortly go on the road in the Western territory. Mr. Miller has been with the company since 1919.

PETER H. BULLOCK retired on May 1 as chief engineer of the Massachusetts Reformatory, at Concord Junction, Mass., after serving continuously in that position for 42 years. Mr. Bullock served his apprenticeship in a railroad shop fifty-six years ago. He was a frequent contributor to the columns of AMERICAN MACHINIST, and in 1888 wrote a series of articles on the "Modern Steam Plant and Its Management."

M. D. EBBETS, formerly of the New York branch of the Sloan Valve Co. of Chicago, has been appointed northern New England representative of the company. Mr. Ebbet will be located at 45 Tremont Bldg., Boston, and his territory embraces Maine, New Hampshire, Vermont and eastern Massachusetts.

T. M. RUSSELL, president of the Russell Manufacturing Co., Middletown, Conn., recently returned to this country after an extended trip into Egypt.

Obituary

ROBERT H. ILLINGWORTH, vice-president of the Crucible Steel Co., died on April 23 at his home in Newark, N. J. Mr. Illingworth had been in the steel business for the past forty-two years.

WALTER E. VOIGHT, president of the Mobile Steel Co., Mobile, Ala., died in that city on April 4.

GEORGE R. WALES, of Beverly, Mass., died in Boston on April 14. He was a member of the firm of John Wales & Co., iron and steel producers.

Trade Catalogs

Simplex Tools. Simplex Tool Co., Woonsocket, R. I. A small booklet describing a line of production and inspection tools. Each type is illustrated and specifications and price lists are included.

Toledo Steels. The Toledo Steel Works, Sheffield, England; manufactured by John Hy. Andrew & Co., Ltd., United States branch, Newman-Andrew Co., New York City, N. Y. A catalog describing a line of crucible steels, made to Sheffield practice. Tables of heat-treatment and annealing operations are given for all kinds. Price lists are included.

"Stoever" Pipe Machines. Treadwell Engineering Co., Easton, Pa. Sixteen-page catalog devoted to a description of "Stoever" pipe machines, made by the Treadwell Company. Several sizes and types are shown, details given and parts illustrated.

The Mummert-Dixon Co., Hanover, Pa., patternmakers and oilstone grinders, are distributing a small booklet entitled "Something Interesting About Stars." It contains some very interesting facts on astronomy, a brief study of cosmogony, and descriptive paragraphs on molecules, atoms and electrons.

Book Reviews

Thermal Expansion of Nickel, Monel Metal, Stellite, Stainless Steel and Aluminum. Scientific Paper No. 426, of the Bureau of Standards, Department of Commerce, by Wilmer H. Souder and Peter Hidnert. Complete copy of the paper may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price, 10 cents.

The increasing use of nickel and nickel alloy wire in spark plugs; of monel metal for high-pressure steam valves, stems, seats; of stellite for surgical and household uses; of stainless steel for engine valves, pump rods, marine fittings; and of aluminum or its alloys where lightness is necessary—has created a demand for information regarding the thermal expansion of these materials. Data on the thermal expansion of twenty-nine samples of these metals are given in this book together with results obtained by previous observers on the expansion of nickel and aluminum. All of these samples except stainless steel (heated to 900 deg. C.) were examined from room temperature to about 600 deg. C.

The results are presented in the form of tables and curves. Commercial nickel indicated only a slight irregularity at about 350 deg. C., and annealing of hot-rolled samples of nickel caused a slight increase in the coefficients. The expansion curves of monel metal were found to be fairly regular, but for temperature range from 25 to 600 deg. C. the average coefficients of the cast samples were greater than those of hot-rolled alloys. Stellite expansion curves showed irregularities in the region between 300 and 500 deg. C., the sample containing tungsten having the smallest coefficient, while there were indications that hammering may lower the value of the coefficient of expansion. Both annealed and hardened stainless steel curves indicated critical regions from 825 to 855 deg. C., the hardened stainless steel curve being irregular between 200 and 400 deg. C., where strains produced in hardening were released. The coefficients of hardened or annealed stainless steel were less than the coefficients of ordinary iron or steel. Thermal expansion of aluminum was found to be approximately twice as large as that of the other materials.

For the range from room temperature to 100 deg. C., the coefficients of expansion varied from 9.6×10^{-6} for a sample of hardened stainless steel to 23.8×10^{-6} for a sample of exceptionally pure aluminum.

Co-operative Competition. A series of twenty-five articles on trade associations published in the New York *Evening Post* and reprinted in pamphlet form. Copies may be secured from the *Evening Post*, 20 Vesey St., New York. Price 25 cents.

Coming at a time like the present when the activities of trade associations are the center of interest in more places than one, this series of articles on various phases of co-operative competition is decidedly timely. The foreword is by Secretary Hoover and the articles are by leaders in various lines of business, trade association officials, Department of Commerce and Federal Trade Commission experts and others. They are worth reading.

Forthcoming Meetings

National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York City, May 8, 9 and 10. Secretary, George Boudinot, 50 Church St., New York.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa. Headquarters will be in the Marlborough-Blenheim Hotel.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

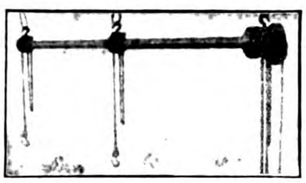
Fly-Cutter Holder, Milling Machine
George W. Dover Co., Inc., Providence, R. I.
"American Machinist," January 19, 1922

The holder is used in making small dies and manifold form cutters for screw machines. It fits over the spindle nose of a milling machine and clamps to the face of the column. The inner end of the arbor is tapered to fit the spindle hole, and bears on a bronze sleeve housed in the frame of the device. The arbor may be held stationary with the cutter in any desired position. The casting carrying the bearing sleeve can be swiveled to an angle of 20 deg. either way, and is graduated.

Tractor, Industrial, Electric, Type-K
Mercury Manufacturing Co., 4118 South Halsted St., Chicago, Ill.
"American Machinist," January 19, 1922

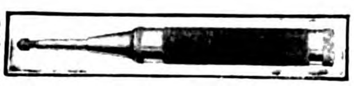
The machine is used for light work in close quarters. A General Electric motor operating on 24 volts and 50 amperes at 1,500 r.p.m. is used, the drive being through worm gearing to the rear axle. The drum-type controller gives three speeds forward and one reverse. The brake is of the contracting-drum type and is operated by a foot pedal. The machine has a normal draw-bar pull of 400 lb., with a maximum of 650 lb. The speed when running light is about 6 miles per hour. Width, 29 in. Height, 48 in. Length, 56 in.

Hoist, Triple-Hook
Wright Manufacturing Co., Lisbon, Ohio.
"American Machinist," January 19, 1922



The three hooks are operated simultaneously by one hand chain and are intended for lifting and conveying flexible materials such as bundles of long wires, metal bars, tubes and sheet metal. The hooks are connected by lengths of pipe, and are ordinarily placed 5 ft. apart, although this distance may be varied. The hoist has a capacity of 1 ton, but can be furnished in larger sizes. It is ordinarily suspended from three ½-ton plain trolleys running on an overhead I-beam.

Scleroscope, Portable, "Auto Punch"
Case Hardening Service Co., 2283 Scranton Road, Cleveland, Ohio.
"American Machinist," January 19, 1922



The device is made in two sizes, the 12-in. size for work on steel, iron and hard metals, and the 6-in. size for sheet brass and thin metals. By pressure on the barrel the spring hammer is released and strikes the ball. The resulting depression in the work is then measured, as in the Brinell test. The tested piece must rest on a solid support, but usually can be tested in position. The hardness of steel plate, stampings, forgings and castings, as well as that of case-hardened and heat-treated work, can be determined. A pressure of 850 kg. on a ½-in. ball gives a depression of the same size as that of the 12-in. punch when testing mild steel.

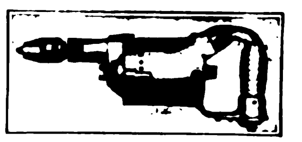
Press, Straightening, Hand, "Production," No. 2P
P. A. Geier Co., Cleveland, Ohio.
"American Machinist," January 19, 1922

The press is adapted to production work on crankshafts. A lever and graduated handwheel apply the driving force. The thrust block of the screw has a range of from 2 to 8 in. distance from the table. The work is straightened without removing it from the centers. A screw is used to adjust the position of the work. A dial indicator having a stroke of ½ in. shows the eccentricity of the work. Rollers mounted above the center points hold the longer work, and for this an extra pair of thrust blocks is furnished. Maximum distance between center points, 40 in. Bed, 26 in. long. Floor space, 22½ x 82 in. Height, 55½ in. Weight, 500 pounds.

Attachment, Milling, Lathe
George W. Dover Co., Inc., Providence, R. I.
"American Machinist," January 19, 1922

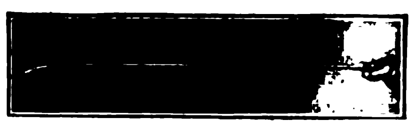
The device can be bolted to the toolblock of an 18-in. engine lathe to do small milling work such as tap and reamer fluting and cutting teeth in small cutters. It is used chiefly in shops where the range of milling work is limited and where no small machine for this work is available. The dividing head is mounted on a graduated swiveling plate that can be set to any angle up to 20 deg. on either side. A set of removable index plates is keyed to the lower end of the spindle. A vise may be mounted in place of the dividing head. A V-block can be attached in any angular position to support slender work. The elevating screw gives vertical adjustments to 0.001 in. The slide may be clamped in any position.

Drill, Electric, Portable, "Buzz"
United States Electrical Tool Co., Cincinnati, Ohio.
"American Machinist," January 19, 1922



The machine is used both for metal drilling and wood boring, and is driven by a universal type motor for both direct or alternating current. The controlling switch is located in the handle. The gears are made of hardened chrome-nickel steel, and run in grease. The spindle is fitted with ball thrust bearings. Spindle speed, 1,100 r.p.m. Weight, 6 pounds.

Hardening Tool, Magnetic, "Temperite"
Pittsburgh Stencil and Tool Co., 40 Water St., Pittsburgh, Pa.
"American Machinist," January 19, 1922



The device is used in determining the proper hardening heat for carbon steel, as ordinary carbon steel attracts a magnet as long as it is under the correct hardening heat, but as soon as this heat is reached the steel has no magnetic attraction. The tool consists of a balanced and insulated magnetic tilting bar mounted on the end of a rod. The bar, made of special steel that enables it to retain its magnetism better than an ordinary magnet, is not affected to any great extent by the heat. The bar will tip when brought near the work, until the correct hardening temperature has been reached, at which point it is no longer affected.

Clip, paste on 3 x 5-in. cards and file as desired

The Weekly Price Guide

THIS WEEK'S MARKET

Advances—Minimum of $1.60 quoted on steel shapes, plates and bars at Pittsburgh mills. Several makers quoting as high as $1.70 per 100 lb. on small tonnages. All semi-finished steel up $2 per ton. Pig iron prices firmer in Pittsburgh and Birmingham. Blue annealed sheets, base size, up 10c. in New York and 5c. per lb. in Cleveland warehouses. Galvanized sheets also slightly advanced in Cleveland. Structural shapes, bars, tank plates and floor plates up 10c. per lb. in Cleveland and New York warehouses.

Lead quoted in New York at 5¾c. as against 5⅝c. per lb.; raw linseed oil at 91c. as compared with 89c. per gal. (5 bbl. lots).

Declines—Tin quoted at 31¾c. as against 32⅛c. per lb. in New York. Declines in copper rods, zinc sheets and brass sheets, rods and wire in New York; slight drop in brass rods and copper sheets, wire and rods in Cleveland.

Improvement in electrolytic copper with upward tendency in price; zinc firm.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$20.50
Northern Basic	20.78
Southern Ohio No. 2	20.50
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.16
BIRMINGHAM	
No. 2 Foundry	16.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22.34
Virginia No. 2	28.24
Basic	20.25
Grey Forge	21.00
CHICAGO	
No. 2 Foundry local	20.00
No. 2 Foundry, Southern, sil 2.25@2.75	16.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.96
Basic	21.46
Bessemer	21.96

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.5	5.0	3.0
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Denver	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.40	3.38	3.15	3.38
No. 12	2.45	3.43	3.20	3.43
No. 14	2.50	3.48	3.25	3.48
No. 16	2.70	3.58	3.35	3.58
Black				
Nos. 17 and 21.	3.00	4.05	3.55	4.10
Nos. 22 and 24.	3.05	4.10	3.60	4.15
Nos. 25 and 26.	3.10	4.15	3.65	4.20
No. 28.	3.15	4.25	3.90	4.30
Galvanized steel sheets:				
Nos. 10 and 11.	3.15	4.25	3.75	4.30
Nos. 12 and 14.	3.25	4.35	3.85	4.40
Nos. 17 and 21.	3.55	4.65	4.15	4.70
Nos. 22 and 24.	3.70	4.80	4.45	4.85
No. 26	3.85	4.95	4.60	5.00
No. 28	4.15	5.25	4.90	5.30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.81	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.70	4.66	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2.58	2.41	2.38
Soft steel bars (base)	2.48	2.31	2.28
Soft steel bar shapes (base)	2.48	2.31	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.58	2.41	2.38
Bar iron (2.00@2.10 at mill)	2.48	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/32	8.00		12@13
1/8	6.50		11@12
5/32 to 1/4	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.62½
Tin, 5-ton lots, New York	31.75
Lead (up to carlots), St. Louis, 5.40; New York	5.75
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.75	6.25
Copper sheets, base	19.50@20.50	19.50	23.00
Copper wire (carlots)	14@14.25	16.00	16.25
Copper rods (ton lots)	17.75	21.00	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	15.75	17.00	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	13.75	15.00	15.75
Brass wire (carlots)	16.25	17.75	.....
Zinc sheets (casks)	8.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....
Solder (½ and ½), (caselots)	23.00	22.00	19.00
Babbitt metal (fair grade)	30.80	39.50	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS--Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	9.50	9.25
Copper, light, and bottoms	8.50	8.50	8.25
Lead, heavy	3.75	3.75	3.65
Lead, tea	2.75	2.75	3.00
Brass, heavy	5.75	5.50	8.00
Brass, light	4.25	4.00	4.75
No. 1 yellow brass turnings	5.00	5.50	5.00
Zinc	2.75	2.25	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

			New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:					
IC,	20x28,	112 sheets	20.00	18.25	18.50
IX,	20x28,	112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:					
IC,	20x28,	112 sheets	17.00	16.00	17.00
IX,	20x28,	112 sheets	20.00	18.75	19.60
Coke Plates, Bright					
Prime, 20x28 in.:					
100-lb.,		112 sheets	12.50	11.00	14.50
IC,		112 sheets	12.80	11.40	14.80
Terne Plate					
Small lots, 8-lb. Coating:					
100-lb.,	14x20		7.00	5.60	7.25
IC,	14x20		7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb.	.055@.09	.09	.09
Wiping cloths per M., 13½x13½	....	50.00	55.00
Wiping cloths per M., 13½x20½	....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb.	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.91	.95	.90
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville...per net ton		$3.25@$3.50	
Coke, prompt foundry, Connellsville...per net ton		$4.25@$4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60–10%	60%
1½ and 1¾x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	......	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	....	65-5%
Lag screws, coach screws	65%	....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	....	55%
Tap bolts, hex. heads	25%	....	.....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ¾ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, $\frac{7}{16}$ in. dia. and smaller	60-5%	60-10-10%	60-10%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ½-in., ¾-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.50	$3.25	$3.00
Cone heads, ditto (net)	3.60	3.35	3.10
1¼ to 1¾-in. long, all diameters, *EXTRA* per 100 lb.	0.25	....	0.15
¾ in. diameter *EXTRA*	0.15	....	0.15
⅞ in. diameter *EXTRA*	0.50	....	0.50
1 in. long, and shorter *EXTRA*	0.50	....	0.50
Longer than 5 in. *EXTRA*	0.25	....	0.25
Less than 200 lb. *EXTRA*	0.50	....	0.50
Countersunk heads *EXTRA*	0.35	......	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40–10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Ill., Chicago—Feiger & Co., 1529 West 14th St.—tinner brake, 8 or 10 ft. long.

Ill., Chicago—The Hess Warming & Ventilating Co., 1219 South Western Ave.—power square shears, (used).

Ill., Oak Park—The Atlas Educational Film Co., 1113 South Blvd.—one engine lathe, 7 x 14 in. swing, short bed, (used).

Kan., Madison—W. J. Turner—centering equipment including 1¼ x 26 or 28 in. mandril and table, for machine shop.

Mass., Cambridge—The Boston Structural Steel Co., Inc., 241 Albany St.—one automatic screw machine, No. 2 Brown & Sharpe preferred, (used); one punch press No. 20 Bliss preferred; one rotary shear and one small hand screw machine.

Mo., Aurora—The Aurora Welding Co.—power lathe and drill press.

Mo., Joplin—J. Bailer Wks., East 5th St., (pump factory), J. Schaeffer, Purch. Agt.—power drill press, lathe, belting and shafting and pump making machinery.

Mo., Joplin—Craig & Bortbeck, Motor A, County Line and Main St., B. D. Craig, Purch. Agt.—power drill press and lathe for garage.

Mo., Joplin—The Greenwell Brass Fdry., East 7th St., F. Greenwell, Purch. Agt.—power lathe for brass work.

Mo., Joplin—M. Henson, 2625 Main St., blacksmith—lathe and drill press for power work.

Mo., Joplin—The Joplin Handle & Novelty Co., 2625 Main St., J. C. McDaniel, Purch. Agt.—large wood lathe and wood working machinery.

Mo., Joplin—The Joplin Mchy. Exchange, 211 East 4th St., W. Clark, Purch. Agt.—lathes for machine shop.

Mo., Joplin—The Kennedy Auto Shop, 26th and Main Sts., J. Higgenbothem, Purch. Agt.—lathe for power equipment.

Mo., Joplin—L. & O. Garage, 2010 Main St., E. C. Lawson, Purch. Agt.—power lathe and drill press.

Mo., Joplin—The Osage Garage, 110-112 Joplin St., F. Cecil, Purch. Agt.—crank shaft, grinder and cylinder grinder.

Mo., Joplin—W. H. Tharp, 2123 Main St., garage—power drill press and lathe.

Mo., Kansas City—The Packard Motor Co. of Missouri, 25th and McGee Sts., garage and machine shop, T. H. Smith, Purch. Agt.—full machine shop equipment for garage.

Neb., Lincoln—The Kimball Motor Car Co., 1608 O St., C. C. Kimball, Purch. Agt.—pneumatic or electric grinder, also lathe with 8 ft. bed.

Neb., Lincoln—The Nebraska Mchy. and Supply Co., 177 North 9th St., W. H. Bixby, Purch. Agt.—wood band saw, plane table; small light high speed drill press; combination punch and shear Beloit preferred; one ton or 1½ ton Yale or similar chain hoist; power hack saw similar to No. 2 Marvel; 75-100 lb. blacksmith vise; 150-175 lb. anvil, (used).

N. Mex., Albuquerque—The Wood Motor Co., M. H. Wood, Purch. Agt.—$2,500 worth of equipment for machine shop including drill presses, grinding machinery, lathes and small tools.

N. Y., Binghamton—F. H. Wilbur & Son, Wall St., F. H. Wilbur, Purch. Agt.—machine tool equipment for shop specializing in repair work, etc.

N. Y., Buffalo—Klink & Shallon, Inc., 620 Babcock St.—packing plant equipment for proposed addition.

N. Y., Buffalo—The Natl. Lamp. Wks. of the General Electric Co., 1495 Fillmore Ave.—machine shop equipment including lathes, drills, etc.

N. Y., Great Bend—The O. L. Sisson Co.—woodworking tools and equipment also sheet metal tools for the manufacture of slatted wood and metal garage creepes.

O., Cincinnati—The Clifton-Pratt Co., 1224 West 8th St., A. B. Clifton, Purch. Agt.—one 36 in. New Haven sand blast barrel, (used).

O., Cincinnati—The Eastern Mchy. Co., 408 East Pearl St., A. Smith, Purch. Agt.—three or four spindle drill press, (sensitive).

O., Cleveland—The County Commissioners, C. J. Heiber, Court House—one LeBlonde quick change lathe, 18 ft. x 10 ft. for road repair department.

Pa., Brookville—The Bd. Educ.—equipment for vocational and engineering departments of the Brookville High School.

Pa., Phila.—F. J. Stokes Machine Co., 17th and Cambria Sts., F. J. Stokes, Purch. Agt.—boring machines, lathes, planer, cranes, etc.

Pa., Pittsburgh—The Edgewater Steel Co., P. O. Box 249, W. A. McKean, Purch. Agt.—one wheel boring mill, motor driven and must have automatic chuck, (used); one Ridgeway type hub facing machine for car wheels, motor driven, (used).

Va., Ashland—Fuqua Stone & Co., auto repairs—lathe, press, grinder and bench tools.

Va., Petersburg—The Petersburg Farm Machine Corp., 1009 South Sycamore St., H. L. Smith, Purch. Agt.—complete line of woodworking, machine shop and foundry machinery and equipment. Will consider slightly used.

Va., Richmond—The Auto Electric Repair Co., 932 West Broad St.—emery wheels, lathe, vise and reamer.

Va., Richmond—W. J. Harris, 820 West Broad St.—drill press.

Va., Richmond—F. D. Schluter, 922 West Broad St.—cylinder grinder and crank shaft grinder.

Va., Richmond—The Transportation Motor Co., 1410 West Broad St.—drill press, lathe and cylinder grinder for auto repair work.

Va., Richmond—H. C. Tutwiler, 1019 West Broad St.—flexible buffer, bead cutter, skiber and tread puller.

Va., Richmond—Winn, Mills & Wiler, 1001 West Broad St.—one 20 ton press, Weaver preferred.

Wis., Kaukauna—The School Bd., L. G. Schussmann, Supt.—complete equipment for manual training department of proposed high school.

Machinery Wanted

Ala., Birmingham—The Corona Coal Co., First Natl. Bank Bldg., A. Peacock, Purch. Agt.—one 36 in. circular saw mill with tilting tables to be used for mine timbers, etc.

Ala., Birmingham—Birmingham Building Material Co., 1317-21 Ave. E South—one cut off saw 24 in.; one planer; one 7½ hp., dc., 1,000 r.p.m. motor.

Ark., Little Rock—The Machinery Exchange, A. O. U. W. Bldg.—complete ice plant machinery for 10 ton ice plant, also direct connected engine and turbo-generator set of 150 kw. to 200 kw. capacity, 3 phase 60 cycle, 80 per cent power factor, exciter and switchboard complete, also turbo generator set of 500 kw. capacity, 3 phase, 60 cycle, 80 per cent power factor, exciter and switchboard complete.

Fla., Fort Meade—L. A. Morgan—canning machinery and equipment for canning factory.

Fla., West Palm Beach—The Atlantic Fish Co., C. Kennedy, Mgr.—fish canning machinery and equipment.

Ga., Barnesville—Collier Mills, Inc., J. A. Cason, Secy.—Wildman or Scott & Williams, 20 in., 21 in., 22 in., 23 in. underwear knitting machines, 12 cut, also one Payne winding machine.

Ga., Macon—W. E. Dunwoody, P. O. Box 255—one tractor for handling transfer cars.

Ga., Tignall—C. H. Hill—machinery for small broom manufacturing plant.

Ill., Dallas City—The Purity Moulding Sand Co.—one 24 ft. portable belt conveyor for handling sand from dump cart to freight cars.

Ind., Butler—The Higley Printing Co., M. Higley, Purch. Agt.—one 10 x 15 job printing press.

Kan., Galena—The Riceville Mining Co., J. Sparks, Purch. Agt.—belting, shafting and pulleys.

Kan., Parsons—P. Foley—equipment for daily newspaper plant.

Kan., Parsons—The Parsons Daily Sun, L. Combs, Purch. Agt.—newspaper equipment.

La., Monroe—The Southwest Pulp & Paper Co., G. Richter, Light & Power Bldg., Watertown, Purch. Agt.—paper making equipment for paper mill including paper machine, Jordan refining engines, Agitator gears and blade fittings, swng cut-off saw, wood rossers, wood chippers, wood screens, pulp screens, steam and acid digesters, conveying equipment, shafting, belting and miscellaneous transmission equipment, variable and constant speed drive clutches, boilers and engines and special lead and brass piping.

Mass., Clinton—The Roubaix Mills, Inc., 792 Main St.—one 66 in. shear, single or double, for shearing woolens and worsted.

Mich., Detroit—The Auto Collapsible Rim Co., Inc., c/o P. R. Rossello, Archt., 406 Congress Bldg.—machine equipment for the manufacture of metal rims and wheel parts.

Mich., Detroit—The Crating & Woodworking Co., 3652 Hart Ave.—woodworking machinery.

Mich., Detroit—The D. E. Morand Mchy. Co., 87 Quincy Ave.—one 300 or 400 lb. board drop hammer.

Mass., Fall River—The Fyans, Fraser & Blackway Co., 83 Anawan St.—automatic looms, (used).

Mo., Carthage—The Leggett & Platt Bed Spring Co., C. B. Platt, Mgr.—machinery for the manufacture of bed springs for proposed factory on Vine St.

Mo., Joplin—Pitkin, Boyd & Neal Packing Co., 7th St.—refrigeration equipment for remodeled plant.

Mo., Joplin—The Typographical Union, Printers Bulletin, 1621 South Main St., E. L. Bucher, Business Mgr. — newspaper equipment and linotype machine.

Mo., Joplin—The Ward Optical Co., 530½ Main St., G. Ward, Purch. Agt.—lens grinder, power.

Mo., St. Louis—The Mindlin Printing Co., 211 North 7th St.—printing press, 10 x 15 or 12 x 18.

Neb., Lincoln—The Independent Bindery Co., 133 South 12th St., W. K. Pease, Purch. Agt.—punching machine and perforating machine either motor or foot power.

Neb., Lincoln—G. V. Keller, 18th and N Sts.—machinery and equipment for repair shop including bench drill press and a lathe about 18 in. x 10 ft.

Neb., Lincoln—The University of Nebraska, L. F. Seaton, Purch. Agt.—one 3 roller cylinder press about 28 in. x 41 in. with motor, brachet, rollers and book chase; one heavy duty press with rollers, counter and motor; one stitcher; one power cutter; type, and cabinet.

N. J., Kearney—The Greenfield Mchy Agency, 99 Tappan St.—one 4 ft. and one 6 ft. power brake, both to bend 4 gage sheets to 90 degrees.

N. Y., Binghamton—The LaFlint Battery Corp., J. W. LaDuska, Purch. Agt.—machinery and equipment for charging and repairing storage cells, electric testing equipment.

N. Y., Brooklyn—D. C. Budd, 128 Martense St.—one steam engine slide valve, 50 hp., and one extractor, Tolhurst preferred.

N. Y., Brooklyn—The Estate of A. Starke, Columbia and Sigourney Sts.—one ton electric hoist for a.c. current.

N. Y., Buffalo—W. H. Beale & Son, 171 Hollywood St.—equipment for dairy.

N. Y., Buffalo—The Male Motor Truck Co., 184 Mohawk St.—one 42 in. arbor press.

N. Y., Buffalo—G. Stinson, 674 Swan St.—woodworking machinery.

N. Y., Corning—M. Gorman—equipment for bakeshop at Eustic, Fla.

N. Y., Fredonia—The E. & O. Mfg. Co.—machinery and equipment for factory recently purchased at Kane, Pa., for the manufacture of automobile signal devices, etc.

N. Y., Hamilton—The Madison County Basket Co., Inc.—machines and equipment for the manufacture of baskets, including steeping vats and washers.

N. Y., LeRoy—The LeRoy Lime & Crushed Stone Corp., J. L. Heimlich, Purch. Agt.—stone drilling, quarrying and crushing machinery.

N. Y., Morris—The Chronicle Office, B. F. Waite, Purch. Agt.—printing equipment and printing matrices for newspaper plant.

N. Y., New York—M. Billet, 40 East Houston St.—one No. 1 plain back geared milling machine.

N. Y., New York—The MacGovern Co., 114 Liberty St.—bending roll, 8 ft. long, 9 in. diameter and one bending roll 146 in. long, 20 in. diameter.

N. Y., New York—The Worthington Pump & Mchy. Corp., 115 Bway., C. W. Hodges, Genl. Purch. Agt.—electrically operated crane, 25 ton capacity for its Blake & Knowles Wks. at East Cambridge, Mass.

N. Y., Rochester—The Scott Bros. Constr. Co.—tools, equipment, etc. for blacksmith shop now under construction.

N. Y., Troy—H. S. H. Co., R. C. Hilton, Purch. Agt.—automatic paper punching and cutting equipment to cut bottle caps out of board.

N. Y., Watertown—The Greens Pastry Shoppe, 228 Goodale St., C. E. Green, Purch. Agt.—mixing and baking equipment for bread and pastry, (electricity for power gas fuel).

N. C., Gibsonville — The Gibsonville Hosiery Mills Co., A. B. Owen, Secy.-Treas. —several 200, 220 or 240 needle ribbers any make, 3½ in. or 3¾ in.

N. C., High Point—R. K. Stewart & Son, R. K. Stewart, Purch. Agt.—Lidgerwood or Stroudsburg double drum hoisting engine and 25 hp. boiler.

N. C., Raleigh—Stanton Bros., J. Stanton, Purch. Agt.—machinery and equipment for dairy at Wilmington.

N. C., Wilmington—The Carters Production Wks., 210 South Water St., O. Carter, Purch. Agt.—machinery suitable for grinding and mixing material to make metal polish.

O., Akron—The Natl. Sulphur Co., Inc.—machinery and equipment for use in manufacture of insecticide powders, sulphur refining, and sulphur products.

O., Cincinnati—The Jones Machine Tool Co., 435 East Pearl St., S. M. Jones, Purch. Agt.—one No. 23 New Brittain automatic, (used).

O., Cincinnati—T. Lee & Sons Co., 128 West 2nd St., R. E. Lee, Purch. Agt.—single end tenoning machine for woodwork, (used).

O., Cleveland—E. G. Bauer, 403 Union Bldg.—small double crank press; small toggle press; thread roller; thread miller (Hobber) about 3 in. x 12 in.; small Landis Universal grinder.

O., Cleveland—The Clinton Co., 6332 Bway.—one overhead bucket type crane conveyor.

O., Columbus—The Central Refractories Co., Ferris Bldg., A. N. Spencer, Vice Pres.—equipment for plant at New Lexington, including dryers, cutters and other brick making machinery.

O., Columbus—The Grandview Lumber Co., Grandview Ave. along the tracks of the Pennsylvania R.R., J. C. McNally, Mgr.—two woodworking machines and planer.

Okla., Hugo—The Hugo Canning & Preserving Co., W. T. Larimore, Secy.—complete line of machinery and equipment for plant for canning tomatoes, also pulping equipment.

Pa., Erie—The Erie Metal Furniture Co. —machinery for proposed factory for the manufacture of metal furniture.

Pa., Hyde Park—The Reading Towel Mfg. Co., Inc., J. R. Geibel, Pres., has purchased the Glasner Hosiery Mills in Reading, will move equipment and will also purchase one hundred looms and minor equipment.

Pa., Koppel—The Koppel Industrial Car Equipment Co., manufacturers of mine cars and equipment—one 7½ ton crane.

Pa., Mansfield—C. M. Thompson—complete equipment for repair and charging of storage cells for plant at Wellsboro.

Pa., Phila.—The American Dye Wks., Tulip and Westmoreland Sts.—balling machine suitable for balling hand knitting yarn.

Pa., Phila.—W. Gadke, 2222 West Huntingdon St., (auto business)—one 16 in. saper in good condition.

Pa., Phila.—The Guarantee Knitting Mills, 514 Market St., automatic knitting machines, carding frames, finishing machines.

Pa., Phila.—The Shingle Leather Co., 315 Vine St.—$50,000 worth of leather working machinery for proposed factory.

Pa., Ridgway—F. K. Brown—complete equipment for bakery to replace that which was destroyed by fire.

S. C., Clinton—The Thornwell Orphanage, L. R. Lynn, Mgr.—complete line of laundry machinery.

S. C., Greenville—The Greenville Plating Wks., T. R. Machen, Pres.—machinery, equipment and supplies for metal plating.

Tenn., Knoxville — The Appalachian Marble Co., Middlebrook Park—air compressor, 300 to 500 cu.ft. capacity, motor or belt driven.

Tex., San Antonio—The Three Rivers Glass Co., Bedell Blvd., C. R. Tips, Secy.-Treas.—automatic glass blowing machinery for use in plant with daily capacity of from 100 to 300 gross bottles.

Tex., Texas City—The Texas City Sun, (Sun Printing Co.)—linotype and intertype for printing plant.

Va., Altavista—Telepost Publishing Co.—W. M. Hundley, Mgr.—complete line of machinery and equipment for proposed newspaper plant.

Va., Radford—The Amer. Steam Laundry Co., W. H. Painter, Pres.—complete line of laundry machinery.

Va., Richmond—The Kimker Service Co., 1205 West Broad St., A. P. Moore, Purch. Agt.—vulcanizing outfit for auto repair shop.

Va., Richmond—The Main St. Auto Supply Co., 1607 West Main St., A. L. Robinson, Purch. Agt.—vulcanizing outfit.

Va., Roanoke—The Liberty Laundry Co. —complete machinery and equipment for laundry.

Va., Roanoke—The White Fdry. Co., 613 10th Ave., H. H. White, Pres. and Mgr.—complete line of foundry machinery and equipment for small foundry.

Va., Smithfield—Sykes & Gwaltney, W. Sykes, Purch. Agt.—oil burning equipment for present planing mill, also miscellaneous woodworking equipment and machinery.

W. Va., Buckhannon—The LaBoard Furniture Co.—Dovetailing machinery for the manufacture of tables.

Wis., Kenosha—The Kenosha Milk Products Co., T. W. Powell, Secy.—refrigeration machinery for proposed milk factory on Bain St.

Wis., Milwaukee—B. Ihlenfeld, 1198 North Pierce St.—one 26 in. to 30 in. band saw.

Wis., Milwaukee—The Milwaukee Bedding Co., 256 South Water St., E. Schilling, Purch. Agt.—special feather renovating machinery and power stitchers.

Wis., Rhinelander—The Oneida Milk & Ice Cream Co., W. Gilley, Purch. Agt.—ice cream making and dairy plant equipment, (power).

Wis., Sheboygan—The city, c/o C. W. Boley, City Hall, City Engr.—manual training equipment for new high school.

Wis., Wausau—H. E. Bonsa—auto repair machinery for proposed garage.

Ont., Hamilton — Townsend, Krug & Greaves, forgings and cutlery, M. J. Krug, Purch. Agt.—forging machinery and equipment for the manufacture of knife and razor blades.

Ont., St. Thomas—D. Barr—materials and equipment for oil and gas drilling.

Ont., Toronto—The Dominion Combing Mills, Ltd., 709 Continental Life Bldg.—machinery for proposed wool combing and washing plant at Trenton.

Ont., Toronto—The Meyers Lumber Co., 15 Toronto St.—planers, saws and woodworking equipment for proposed planing mill on Spadina Rd.

Ont., Welland—The Lackawanna Tubes, Ltd.—machinery for the manufacture of seamless boiler tubes.

Que., Montreal—The Empire Brass Fdry., 128 Wellington St., A. Smith, Purch. Agt.—complete equipment for brass foundry.

Metal Working Shops

Cal., Oakland—The Magnovox Co., 2725 East 14th St., is having plans prepared for the construction of a 2 story, 60 x 200 ft. addition to its factory on East 14th St. for the manufacture of telephones and land speaking devices. Estimated cost, $60,000. B. J. S. Cahill, Easton Bldg., Archt.

Cal., San Francisco—L. H. and E. W. Allyne, 2609 Gough St., have awarded the contract for the construction of a 2 story, 98 x 137 ft. garage on Pine St. near Polk St. Estimated cost, $40,000.

Cal., San Francisco—T. W. Corder, Inc., c/o S. Schell, 180 Jessie St., has awarded the contract for the construction of a 1 story, 25 x 75 ft. addition to his elevator shop on Natoma St. near 7th St. Estimated cost, $5,000.

Cal., San Francisco—W. P. Stoesser, 53 Shotwell St., will build a 1 story, 25 x 122 ft. lock manufacturing plant on Shotwell St. near 14th St. Estimated cost, $5,000.

Col., Denver—The Super Service Motor Co., 410 Colorado Bldg., has awarded the contract for the construction of a 3 story, 115 x 210 ft. service garage on 7th and Speer Blvd. Estimated cost, $300,000.

Ill., Casey—The Western Radiator Corp. has awarded the contract for the construction of a 1 and 2 story, 150 x 260 ft. factory. Estimated cost, $100,000.

Mass., Everett—The Boston Elevated Ry. Co., 108 Massachusetts Ave., Boston, plans to build a repair shop, etc., here. Estimated cost, $750,000. M. L. Fernald, care of owner, Engr.

Mass., Everett—The Cameron Appliance Co., 48 Waters Ave., plans to build a 1 story, 70 x 115 ft. galvanizing factory at plant. Estimated cost, $40,000. MacVaughton & Robinson, 101 Tremont St., Boston, Archts.

Mass., Holyoke—The Magna Auto Co., 2 Division St., has awarded the contract for the construction of a 2 story, 116 x 120 ft. garage and service station on Northampton St. Estimated cost, $40,000.

Mass., Medford—The Amer. Radio & Research Corp. has awarded the contract for the construction of a 2 story, 61 x 120 ft. radio factory. Estimated cost, $50,000. Noted April 27.

Mass., Northampton—P. P. Gleason, Pearl St., will soon award the contract for the construction of a 2 story, 80 x 130 ft. garage and service station on Pleasant St. Estimated cost, $50,000. G. P. B. Alderman & Bro., 318 High St., Holyoke, Archts.

Mass., Willimansett (Holyoke P. O.)—The Palmer Steel Co., 316 High St., Holyoke, will soon award the contract for the construction of a 1 story, 80 x 200 ft. steel fabricating plant along the railroad tracks, here. Estimated cost, $75,000. Private plans.

Mich., Detroit—The Auto Collapsible Rim Co., Inc., c/o P. R. Rossello, Archt., 406 Congress Bldg., is having plans prepared for the construction of an 8 story, 110 x 166 ft. auto rim factory on Bellevue Ave. Estimated cost, $500,000.

Mich., St. Joseph—The Auto Specialty Mfg. Co. will soon award the contract for the construction of a 1 story addition to its factory. Estimated cost, $100,000. Davidson & Weiss, 53 West Jackson Blvd., Chicago, Archts. Noted Feb. 23.

Minn., St. Paul—The Siems-Stembel Co., 2700 Como Ave. W., will build a 1 story, 230 x 750 ft. car repair shop on Como Ave. W. Estimated cost, $75,000.

Mo., Carthage—The Leggett & Platt Bed Spring Co. plans to build a factory on Vine St. for the manufacture of bed springs. Estimated cost, $50,000. C. B. Platt, Mgr. Architect not selected.

N. J., Camden—The Neel Cadillac Co., 525 Market St., is having plans prepared for the construction of a 2 story, 80 x 175 ft. garage and service station on Federal St. Estimated cost, $75,000. Lakey & Hettle, 5 Hudson St., Archts.

N. Y., Brooklyn—The Kroder & Reubel Co., 107 East 17th St., New York City, will soon award the contract for the construction of a 3 story factory on Henry St., for the manufacture of brass goods. Estimated cost, $150,000. R. Berger & Son, 309 Bway., New York City, Archts. and Engrs.

N. Y., Buffalo—The Crane Co., 836 South Michigan Ave., Chicago, Ill., has purchased a site along the Erie Canal at the foot of Church and Genesee Sts., and plans to build a 200 x 222 x 282 ft. plumbing plant, here. Estimated cost, $250,000. F. Zander, 81 Bway., Buffalo, Local Mgr. Architect not announced.

N. Y., Buffalo—The Natl. Lamp Wks. of the General Electric Co., 1495 Fillmore Ave., plans to build a 1 story, 38 x 43 ft. machine shop on Fillmore Ave. Estimated cost, $15,000. Architect not announced.

N. Y., Buffalo—H. Wolcott, 3042 Main St., plans to build a 50 x 100 ft. charging station and small shop on Main St. Estimated cost, $5,000. Architect not announced.

N. Y., Gouverneur—The City will vote on $80,000 bonds May 10 for fire station equipment, storage and machine repair station. Address G. E. Dawley, Pres.

N. Y., New York—W. C. Bergen, c/o C. S. Clark, Archt. and Engr., 441 Tremont Ave., will build a 2 story garage on Webster Ave. Estimated cost, $150,000.

N. Y., New York—M. Kaufman, c/o A. J. Simberg, Archt. 1133 Bway., is having plans prepared for the construction of a 2 story, 90 x 150 ft. garage at 225 St. Nicholas Ave. Estimated cost, $100,000.

N. Y., New York—Lampert Estate, c/o Euell & Euell, Archts., 125 Sherman Ave., is having plans prepared for the construction of a 1 story, 100 x 199 ft. garage on 10th Ave. Estimated cost, $100,000.

N. Y., Rochester—The Vogt Mfg. Co., 408 St. Paul St., is having plans prepared for the construction of a 48 x 127 ft. factory on Emmett St. for the manufacture of iron and steel specialties. Estimated cost, $10,000. Architect not announced.

N. Y., Utica—E. Steinhorst has awarded the contract for the construction of a 1 story, 70 x 140 ft. sheet metal plant at Mohawk and Eagle Sts. Estimated cost, $20,000.

O., Euclid—M. Brewer and J. B. Clark, 18601 Abbey Rd., have had plans prepared for the construction of two 1 story garages 48 x 80 ft. and 40 x 50 ft., at Stop 10½ Euclid Ave. Estimated cost, $40,000. Private plans.

O., Marion—The Commercial Steel Castings Co., manufacturers of open hearth steel castings, has awarded the contract for the construction of buildings and additions to present plant.

O., Silica—(Sylvania P. O.)—The Sandusky Cement Co., Engineers Bldg., Cleveland, has awarded the contract for the construction of a 1 story, 40 x 240 ft. office, storage and repair shop. Estimated cost, $150,000.

Pa., Bridgeport—Gehret Bros. are receiving bids for the construction of a 1 story, 80 x 120 x 200 ft. structural steel fabricating plant. Estimated cost, $50,000. Private plant.

Pa., Chester—The Chester Dairy Co. will build a 1 story, 45 x 150 ft. metal works plant on 9th and Hyatt Sts. Estimated cost, $50,000.

Pa., Corapolis—Russell, Burdsall & Ward Bolt and Nut Co., Port Chester, N. Y., is having plans prepared for the construction of a steel foundry plant along the tracks of the Pennsylvania & Lake Erie R. R. here. Estimated cost, $75,000. Private plans.

Pa., Erie—The Erie Metal Furniture Co. will soon award the contract for the construction of a 1 story, 120 x 200 ft. metal furniture factory. Estimated cost, $65,000. Architect not announced.

Pa., Erie—The Union Iron Wks., Inc., will build factory for the manufacture of machinery, etc., to replace the one destroyed by fire. Estimated cost, $100,000.

Pa., Phila.—J. J. Greenberg, Morris Bldg., is having plans prepared for the construction of a 6 story, 55 x 150 ft. sales and service station at 1409-11 Broad St. Estimated cost, $200,000. L. B. Rothchild, 1225 Samson St., Archt.

Pa., Phila.—The International Harvester Co., 21 North 23rd St., has awarded the contract for the contruction of a 5 story, 100 x 130 ft. warehouse and a 1 story, 64 x 100 x 140 ft. service station on 16th St. and Indiana Ave. Estimated cost, $500,000. Noted April 13.

Pa., Phila.—L. J. Kolb, 10th and Reed Sts., has awarded the contract for the construction of a 2 story garage on Ridge Ave. and Lenon St. Estimated cost, $52,600.

Pa., Phila.—G. H. Seddon, 31st St. and Sunnyside Ave., has awarded the contract for the construction of a 1 story, 84 x 101 ft. garage on Ridge and Midvale Aves. Estimated cost, $40,000.

Pa., Phila.—F. J. Stokes Machine Co., 17th St. and Columbia Ave., will build a 1 story, 91 x 140 ft. machine shop, Tabor Rd. and Perry St. Estimated cost, $15,000.

Va., Norfolk—Lowenberg-Goodman Corp., 127 Granby St., will soon award the contract for the construction of a 2 story, 91 x 305 ft. garage on Granby and 11th Sts. Estimated cost, $150,000. Calrow & Wrenn, New Monroe Bldg., Archt.

Wis., Madison—A. E. Small, Archt., Ellsworth Bldg., will open bids about May 10 for the construction of a 1 story, 60 x 186 ft. garage on University St., for W. F. Clark, 2105 Keyes Ave. Estimated cost, $45,000. Noted April 13.

Wis., Wausau—H. E. Bonsa is having plans prepared for the construction of a 1 story, 50 x 95 ft. garage. Estimated cost, $40,000. Oppenheimer & Obel, Spencer Bldg., Archt.

Ont., Wallaceburg—The Prestolock Co., of Canada plans to build a factory for the manufacture of automobile locks and radio equipment. Estimated cost, $20,000. E. E. Theis, Pres. Architect not selected.

Ont., Welland—The Lackawanna Tubes, Ltd., plans to build an 80 x 400 ft. addition to its factory for the manufacture of seamless boiler tubes. Architect not announced.

General Manufacturing

Cal., Monte Vista—The Monte Vista Packing Co. has had plans prepared for the construction of a 1 story cannery. Estimated cost, $45,000. W. W. Breite, Clunie Bldg., San Francisco, Engr. and Construction Mgr.

Cal., Newcastle—The Newcastle Fruit Growers Assn. has awarded the contract for the construction of a 2 story, 90 x 110 ft. packing plant. Estimated cost, $150,000.

Cal., Newman—The Natl. Ice Cream Co., 371 Guerrero St., San Francisco, has awarded the contract for the construction of two additions to ice cream plant here, one 45 x 45 ft. and other 15 x 78 ft. Estimated cost, $27,000. Noted Feb. 9.

Cal., Pittsburg—The California Bean Growers Assn., 120 Battery St., San Francisco, is having plans prepared for the construction of a cannery and warehouse (first unit). Estimated cost, $100,000. MacDonald Eng. Co., 149 California St., San Francisco, Engrs.

Cal., San Leandro—Alameda County, Oakland, is having plans prepared for the construction of a 1 story laundry and a 1 story power house, on the County Infirmary site, here. Estimated cost, $60,000. H. H. Meyers, Kohl Bldg., San Francisco, Archt.

Cal., San Francisco—The Bothin Real Estate Co., Atlas Bldg., has awarded the contract for the construction of a 2 story knitting mill on Howard and 8th Sts. Estimated cost, $30,000. Snyder Bros. Knitting Mills, 804 Mission St., Lessee.

Fla., Loughman—The Everglades Cypress Lumber Co. will build lumber mill to replace the one destroyed by fire. Estimated cost, $175,000.

Ill., Chicago—The Baubien Novelty Co., 347 St. Johns St., has awarded the contract for the construction of a 1 story, 28 x 118 ft. factory on St. Johns St. Estimated cost, $10,000.

Mass., Adams—The Berkshire Cotton Mfg. Co. has awarded the contract for the construction of a 1 story, 50 x 170 ft. addition to its mill at plant. Estimated cost, $40,000.

Mass., Boston—The Nash Carriage Co., 841 Massachusetts Ave., Roxbury, plans to build a 1 story, 100 x 114 ft. carriage factory in the Roxbury Section. Estimated cost, $50,000. Architect not selected.

Mass., Clinton—The Bigelow-Hartford Carpet Co., 58 Main St., Thompsonville, Conn., will soon receive bids for the construction of a 1 story, 100 x 275 ft. dyehouse; a 4 story, 100 x 114 ft. headhouse at plant. Estimated cost, $250,000. C. T. Main, Inc., 201 Devonshire St., Boston, Archt. and Engr. Noted April 13.

Mass., North Billerica—The Talbot Mills has awarded the contract for the construction of a 4 story 77 x 210 ft. addition to mills.

Me., Sanford—The Goodall Worsted Co. has awarded the contract for the construction of a plant here, including a storehouse, combing and worsted yarn spinning buildings.

Mich. Sault-Ste-Marie—The Cadillac Lumber & Chemical Co., Cadillac, is having plans prepared for the construction of a 2 story, 95 x 280 ft. and 100 x 114 ft. saw mill with a 32 x 40 ft. engine room and steam power plant. Estimated cost, $200,000. C. Hall, 221 Grand Ave., Milwaukee, Wis., Engr.

Minn., Minneapolis—The North Star Woolen Mills Co., 228 South 2nd St., has awarded the contract for remodeling a 6 story, 44 x 98 ft. factory on 6th Ave., S., between 1st and 2nd Sts. Estimated cost, $60,000.

Mo., Joplin—Pitkin, Boyd & Neal Packing Co., 7th St., is receiving bids for the construction of a 2 story storage and refrigeration plant on 7th St. Estimated cost, $5,000. Private plans.

Mo., St. Louis—The Heil Packing Co., 2216 La Salle St., has awarded the contract for the construction of a 2 story, 40 x 100 ft. and 15 x 17 ft. addition to its packing plant. Estimated cost, $30,000. G. L. Heil, Pres.

N. H., Laconia—The Pitman Mfg. Co. is having plans prepared for improving and building a 3 story, 65 x 100 ft. addition to its factory. Estimated cost, $50,000. Lockwood, Greene & Co., 60 Federal St., Boston, Engrs.

N. J., Gloucester—C. C. Coolbaugh & Sons, 19th and Cambria Sts., Phila., are receiving bids for the construction of a 1 and 2 story lumber mills on Nickolson Rd. Estimated cost, $25,000. Private plans.

N. Y., Buffalo—W. H. Beale & Son, 171 Hollywood St., plans to build a 1 story, 18 x 26 x 70 ft. dairy plant on Hollywood St. Estimated cost between $4,500 and $5,000. Architect not announced.

N. Y., Buffalo—Klink & Shallon, Inc., 620 Babcock St., plans to build an addition to its packing plant on Babcock St. Estimated cost, $19,000. Architect not announced.

N. Y., Franklinville—The Ontario Cutlery Co. plans to build a 4 story, 72 x 200 ft. factory. Estimated cost, between $160,000 and $180,000.

N. Y., Natural Dam—The Aldrich Paper Co., Gouverneur, plans to build paper manufacturing plant to replace the one destroyed by fire several years ago. Estimated cost between $500,000 and $600,000. Address N. R. Caswell, Gouverneur.

O., Silica—(Sylvania P. O.)—The Sandusky Cement Co., Engineers Bldg., Cleveland, has had plans prepared for the construction of a 1 story cement plant here. Estimated cost, $1,000,000. W. B. Rawson, Engineers Bldg., Cleveland, Archt. and Engr.

Pa., Brockwayville—The Brockwayville Macaroni & Supply Co. is having plans prepared for the construction of a 2 story, 48 x 50 ft. factory. Estimated cost, $50,000. Private plans.

Pa., Phila.—Blumenthal Bros. will soon receive bids for the construction of a 4 story, 80 x 250 ft. cocoa factory on Margaret and James Sts. Estimated cost, $180,000. Ballinger & Co., 12th and Chestnut Sts., Archts.

Pa., Phila.—J. Frank & Sons, 32 North 3rd St., are having plans prepared for the construction of a 2 story, 18 x 200 ft. warehouse and hat factory on North 3rd St. Estimated cost, $35,000. B. Brown, Drexel Bldg., Archt.

Pa., Phila.—The Kensington Ice Co. ha awarded the contract for the construction of a 2 story, 65 x 112 ft. ice manufacturing plant on Lackawanna and Church Sts. Estimated cost, $15,000.

Pa., Phila.—W. F. Kreiss & Co., 1708 North Front St., has awarded the contract for the construction of a 2 story, 50 x 146 ft. bedding factory on Trenton and Auburn Aves. Estimated cost, $35,000.

Pa., Phila.—S. Weitz, c/o D. D. Weitz, Archt., Real Estate Trust Bldg., has awarded the contract for the construction of a 1 story, 62 x 72 ft. and 1 story, 18 x 91 ft. slaughtering plant and garage at 2838 North 28th St. Estimated cost, $60,000.

Pa., Phoenixville—The Welland Packing Co. will build a 2 story, 52 x 62 ft. and 29 x 79 ft. packing plant. Noted April 20.

Va., Altavista—The Telepost Publishing Co., will receive bids until June 1 for the construction of a 1 story, 40 x 60 ft. newspaper plant. Estimated cost, $16,000. W. M. Hundley, Mgr. G. Stone, Altavista, Archt.

Va., Radford—The Amer. Steam Laundry Co. plans to build a 2 story, 40 x 100 ft. laundry. Estimated cost, $15,000. W. H. Painter, Pres. Architect not selected.

Wis., Kenosha—The Kenosha Milk Products Co., has awarded the contract for the construction of a 1 story, 50 x 75 ft. milk factory on Bain St. Estimated cost, $75,000. T. W. Powell, Secy.

Wyo., Yoder—C. W. Goodrich, Casper, plans to build a brick plant here.

Ont., St. Marys—The Hurlburt Shoe Co. is having plans prepared for the construction of a 2 story, 50 x 60 ft. addition to its shoe factory. Estimated cost $25,000. C. E. Hurlburt, Mgr. Private plans.

Ont., Toronto—The Meyers Lumber Co., 15 Toronto St., will build a planing mill, to consist of a 2 story 70 x 80 ft. lumber mill; 1 story, 28 x 34 ft. office and a 2 story, 28 x 34 ft. stable, on Spadina Rd. Estimated cost, $25,000. Private plans.

Ont., Trenton—The Dominion Combing Mills, Ltd., 709 Continental Life Bldg., Toronto, will soon award the contract for the construction of a wool combing and washing plant here. Estimated cost, $200,000. B. H. Prack, 50 Bay St., Toronto, Archt.

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American Machinist

KENNETH H. CONDIT and FRED H. COLVIN, *Editors*
L. C. MORROW, *Managing Editor*
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Methods of Machine Tool Design—A. L. DeLeeuw
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October 7, 1921

ALL OUR QUOTATIONS AND PROPOSALS ARE FOR PROMPT ACCEPTANCE AND ARE SUBJECT TO CHANGE WITHOUT NOTICE. DELIVERIES NAMED ARE BASED UPON ESTIMATED PRODUCTION AND EVERY EFFORT WILL BE MADE TO KEEP THEM, BUT OWING TO THE UNCERTAINTIES OF MANUFACTURING CONDITIONS WE WILL NOT GUARANTEE DELIVERIES. DELIVERIES NAMED ARE ALSO SUBJECT TO PRIOR SALE AND DELAYS CAUSED BY FIRES, STRIKES, ACCIDENTS, DELAYS OF CARRIERS AND OTHER CAUSES BEYOND OUR CONTROL. ORDERS ACCEPTED BY US MAY NOT BE CANCELED WITHOUT OUR CONSENT.

American Machinist,
10th Ave. & 36th St.,
New York, N.Y.

Gentlemen:

I entered the employ of Lodge, Davis & Co., machine tool builders, and the predecessors of The American Tool Works Co., in the year 1888, at which time-- in fact for some years before-- the company was advertising in the "American Machinist". Its successors, partly under my direction, have been advertising in the "American Machinist" ever since-- in fact I do not recall that we ever withdrew our advertisement even for a single week.

From this statement you will note that this company and the writer have had a broad and varied experience with the "American Machinist", passing through good times and bad in the machine tool industry, and it has always been considered one of our best business getters.

In my opinion the "American Machinist" is practically an integral part of the machine tool industry, and one cannot think of one without the other, nor consider any plans for the selling of machine tools without considering the "American Machinist" as part of the plan.

Getting right down to actual facts, I would state that we receive many inquiries from all over the world as a direct result of our advertisement in the "American Machinist", and have been doing so for many years, which inquiries are likely obtained much more cheaply than they could be by direct advertising.

From this experience I could do nothing else than to most heartily congratulate you upon your Forty-Fourth Anniversary, and to express the hope that you will continue to grow and enlarge your sphere of activity and helpfulness, for not only your good but for the good of the entire machine tool industry.

Sincerely yours,

J B Doan

President and General Manager
THE AMERICAN TOOL WORKS CO.

JBD-EB

American Machinist

Volume 56 NEW YORK, MAY 11, 1922 Number 19

Simplification—What Does It Offer in the Machine Industry?

Diversification of Product Causes Many Needless Wastes—Organization in the Department of Commerce to Aid Simplification—How the Work of Simplification Is Conducted

BY WILLIAM A. DURGIN
Department of Commerce

"WE ARE making altogether too many sizes. Week before last all our B automatics ran continuously on one size, and we got very attractive production cost. Last week, we had to alter the set-up on that same group nineteen times to make as many different sizes, and of course production cost went out of sight."

How many manufacturers have you heard say something of that sort these last few months? How many times have you said it yourself? And the jobber or retailer—any representative of the distributing group—will join the chorus with the refrain, "Yes, you are making altogether too many sizes; my shelves are loaded with thousands of items; my investment is extended way beyond my means, and the turnover is so small that I can't find the profits. Even so, I am carrying only part of the line I should have, for when customers come in for replacements or repairs, seems as though I always have to send somewhere to get them."

"That's right," says the user, the third and largest class, "if I invest in any kind of contraption which has to have repairs, or other maintenance, it is just my luck every time to get the one that is eternally different from everything else in town; I always have to wait days or weeks to get any spare part, and often I have to have something made special to fit."

All through the industrial structure this tale of over-diversification, the tremendous waste in making needless varieties, is beginning to be one of the commonplaces of shop talk. Bad enough under boom conditions with universally high demand and prosperous business, it becomes a vital weakness of our American business methods when the cataclysm of war wipes out the buying power of Europe, upsets economic balance throughout the world, and stretches the spread between raw material and finished product so tremendously that our American standard of living is imperiled.

Probably no man sees these conditions more clearly than Secretary Hoover, of the Department of Commerce. To him, elimination of the waste variously estimated at from 25 to 40 per cent of our total industrial effort, is a basic necessity if we are to reduce the spread between raw and finished products, maintain our American standards, and get our full share of world trade.

Prominent among his means for such waste elimination, is simplification, the concentration of effort on the comparatively few sizes of each line which really count in a large way, and the co-ordination of allied lines to secure maximum interchangeability. To carry this movement forward with as much force as possible, the Secretary has organized the "Division of Simplified Practice" of the Department of Commerce, offering the clearing house facilities and adding the moral weight which only a governmental department can give in the highest degree. To some, the Division of Simplified Practice appears the heir and executor of the Conservation Division of the War Industries Board, continuing those reductions of variety and simplifications of procedure which the stress of war made necessary, but which experience proved advantageous to all concerned. To others, the division is most clearly conceived as a liaison group between the Bureau of Standards and the industrial and business interests in carrying forward such standardizations as have direct bearing on waste elimination. While to still another group, it appeals as one of Secretary Hoover's most original contributions, through his conception of the Department of Commerce as the servant and representative of business and industry.

> SIMPLIFIED PRACTICE in any line will result in some or all of the following advantages:
>
> Reduction of stocks and investment, and increase in turnover.
>
> Lower costs to the public through mass production and the intelligent application of the repetitive process.
>
> Lower costs all along the line through quicker deliveries from simplified stocks.
>
> More stable employment by permitting the safe accumulation of standard lines of stock through slack periods.

The truth combines all these interpretations and has perhaps a still more fundamental aspect. Excessive diversification was probably foredestined as an inevitable result of our first flounderings with the facilities which machinery, steam and electricity placed in our inexperienced hands. Similarly the corrective, simplification, is just as inevitable if we are to get the full value of these facilities for our daily living. With the

production of automatic machinery and the release of tremendous stores of natural energy in the form of cheap power, it has been comparatively easy for almost anyone to become a manufacturer. The machines themselves supplied all the intelligence necessary to gain the benefits of the repetitive process and moderately low production costs. The factory once started almost ran itself and the attraction of manufacturing drew many men whose inspiration was profit rather than craftsmanship. Thus production plants have been multiplied, often with little basis of improved quality or design of product, much of the output being quite obviously as close a copy of successful lines as was legally possible. When it came to selling these closely similar lines, it proved easiest to make superficial changes in dimensions or finish that could be used by the selling force in their sales talk—and at once we were in a fair way to be swamped with varieties.

Long before the war we had begun to suffer from this saturnalia of diversification. Many of you will remember the remarkable popularity of Wagner's sermon-essay, "The Simple Life," which appeared at the beginning of the century. His objective, of course, was the simplification of daily living, but there is a very definite correlation with our present interest. Even in the prosperity preceding the World War, the extreme diversifications of product were imperiling our commercial stability, dilating the development of product by spreading attention over the unnecessarily wide lines, depreciating quality, and tremendously increasing costs.

Under present conditions, not only are these weaknesses intensified but the new diseases suggested above appear on every hand. Stocks and investment are needlessly extended. Turnover is decreased. Costs of production are run up in each of numberless varieties. Deliveries are delayed in getting the particular item ordered. It is unsafe to accumulate stock during slack periods, for no man can predict just what variety will be demanded when the boom appears. All the wastes attendant on indecision of production in use are prevalent. Selling expense is boosted to a maximum in covering the many varieties. Misunderstandings and misrepresentations are prevalent. There is little fundamental investigation and development of basic lines, as it is so much simpler to change trifling details and start a new variety.

With such conditions, it is little wonder that there is a real demand among manufacturers, distributors and users for reduced varieties, for agreement on certain fundamentals of dimensions and nomenclature which shall simplify and stabilize production, reduce costs and stimulate business. But admitting this demand, you say, and fully realizing the importance of prompt action, why does not the industry carry through itself —what service can Government offer which will be of fundamental importance? Just the service that democratic government can offer in all relations of organized life—the co-ordinating and making effective of the best practice and opinion of our people.

If manufacturers alone start a program of simplification, it is open immediately to suspicion of purely selfish interest; and similar suspicions apply to movements started by distributors, or by users. But if all groups are brought together through a conference of representatives of recognized standing in their respective fields, the joint conference can work out a compromise recommendation which will represent the best available solution of the existing problem. Then the Government can adopt this recommendation as its own and give it formal standing as the recommended practice of the country.

It is exactly along these lines that the Division of Simplified Practice is working. We make no pretense of detailed knowledge in any specific field. We can not say, for example, just the extent of the benefits simplification of machinery will bring to all those interested in its production, distribution and use. If any group in the machinery field, however, believes that the benefits are worth while, the division stands ready to get together all others interested in a general conference which can discuss the whole question and, if it proves desirable, arrive at a definite recommendation for procedure.

As an example of the very obvious advantages which will accrue to all of us from simplification in some lines, the conditions in the bedstead industry may be cited. At present manufacturers of metal beds have agreed upon certain standard dimensions of length and breadth. Manufacturers of wooden beds have also agreed upon their ideas of standards. Makers of metal spring mattresses attempt to conform to the standards established by the two groups of bed manufacturers. Makers of fabric mattresses also attempt to conform; but to date the standardization is largely on paper. The groups have gone ahead separately. Attempts at joint action have proved futile, and the so-called independent manufacturers, not allied with trade associations, have developed as many dimensions as their individual ideas have suggested. Often the chance dimensions of the raw material have fixed those of the finished structure. As a result, when you or I need a spring or mattress,

SOME OTHER advantages obtained by the use of Simplified Practice are:

A marked decrease of present selling expenses, which have been so much increased with tremendously extended varieties; this applying not only to the salesmen themselves, but to their equipment and catalogs and to the general office accounts.

A much better understanding between buyer and seller through their use of a definite vocabulary.

The concentration of thought and effort on the cream of each line, which must result in the best possible product.

Finally the bringing of our production into line for the genuine development of foreign commerce. England, Germany and other countries have vigorous national movements towards standardization which must be met if we are not only to hold our own in foreign markets, but make the notable advances which the war's disturbance of economic balance makes possible.

the dealer has to send a man to measure our bedstead and make something special, so that these industries proceed on a tailoring rather than a manufacturing basis.

The bed business needs the centralization and moral force which can be given by leadership of the Department of Commerce. This particular simplification is well under way, and in the near future the interested groups will unite in a general recommendation of the recognized length for all beds, and widths for double beds, twin beds, cots, and institutional beds, which can be promulgated as the simplified practice of the country. In arriving at these figures full weight will be given to development of the foreign market, and from the simplified recommendation we hope will result such a reduction in production costs, of stocks and selling costs, such an increase in turnover, that employment in the bedstead and allied industries will be stabilized, the business of individual manufacturers secured, and the cost to each of us in our own homes materially reduced.

Artistic License and Simplification

Please notice that in all this there is no question of the art design or finish of the bedstead. The artist is still fully at liberty. Surely he can create just as beautiful a Chippendale if he adheres to an internal length of 6 ft. 3 in., which will accommodate all of us, as if, on the spur of the moment, he adopts 5 ft. 11 in. and so imposes a double reversed curve on the occupant.

Beds are but an example; it is difficult to think of any commodity which the story doesn't fit. But in considering the almost limitless field, please remember, always, that the whole endeavor carefully avoids interference with art or style, and indeed just as carefully avoids interference of any sort.

Probably this example will suggest the necessary procedure to arrive at formal simplification. The first step is to arrange for securing statistics, or other data, which shall show present conditions and indicate the line for action. For the machinery interests, the representative trade associations would appoint a small contact committee to get in touch with Secretary Hoover and the Division of Simplified Practice. After a conference at Washington, this committee would proceed to survey the machinery field for the Department of Commerce, getting figures showing varieties manufactured and the importance of the several items during the last few years. The committee would summarize these data in a report covering present conditions, and would then forward the summary to the Division of Simplified Practice. With this report before it, the division would prepare a tentative list of representatives to the general conference—the personnel of the list being submitted to all trade associations interested, and to the United States Chamber of Commerce, the American Engineering Standards Committee, and other bodies, to insure that every factor in the field was given proper voice. All the representatives included in the final amplified list would then be invited to a conference in Washington, and this conference would proceed to work out such recommendations for simplification as the general discussion should develop. The conference would further decide how frequently similar conferences for revision of the recommendations should be called, and each representative would engage to obtain the approval of his association, firm, or other parent body, to the recommendations as finally adopted. Finally, the Division of Simplified Practice, for the Government, would give national standing and publicity to the action of the conference by issuing the recommendation as one of its official series. This series will be numbered in sequence and will be known as "Simplified Practice Recommendations of the Department of Commerce." As a part of its service the division will obtain a formal letter of acceptance of the recommendation from each of the bodies represented at the conference, and, when necessary, from the individual members of those associations most interested. At regular intervals, statistics from all manufacturers and distributors as to the percentage of business done in the simplified sizes will be requested, and the division will accumulate data on necessary revisions, calling the conferences for such revision at the times originally set by the industry.

Simplifications of Allied Lines Necessary

With movements of this sort now going forward in many industries, it is essential that the simplifications of allied lines properly fit together. Obviously simplification of machinery is very closely allied to simplification of brass and steel shapes and sizes; similarly, simplification of wooden bedsteads is closely related to that of lumber, and so on. Thus there is an additional reason for co-ordinating these movements through a government division.

This function of co-ordination can not be too strongly emphasized. There is no question of imposing simplification, the division being intended simply to function as as centralizing unit for those simplifications of dimensions and nomenclature already demanded by manufacturer, distributor or user. If, in the judgment of any industry, simplification is not suitable to its problem, it need fear no interference, but it had best look to its economic stability as threatened by over-diversification. The benefits of simplification are already so evident to a wide range of industries that the general movement is certain to go forward of its own momentum, and the Division of Simplified Practice hopes to aid in lasting elimination of waste.

Automotive Service Methods and Equipment

IX. Some Unique Service Tools—"Roll Your Own" Fenders—Making Bronze Bushings in the Machine Shop—A Home-made Running-in Stand

By HOWARD CAMPBELL
Western Editor, American Machinist

WITH the passing of the stage coach and the development of more efficient methods of transportation, the reputation of the express companies for "delivering the goods" has been enchanced by the use of transportation units of the most modern type. The Chicago division of the American Express Co. operates a fleet of motor trucks among which are included both gasoline and electric units, and the equipment for servicing these units includes some pieces that will be interesting to other service managers.

A piece of home-made equipment known as a "spring vise" is shown in Fig. 1. This vise is used for holding springs when it becomes necessary to separate the leaves of the spring for the purpose of cleaning, for replacing broken leaves with new ones, or for putting in new center bolts.

The side frames *A* are made of ¾-in. angle steel, and the flat pieces across the bottom of the vise are of ¾-in. flat steel. The other sections of angle steel are ¼ in. thick. Some of these sections are riveted so as to form ways as shown at *B*, and steel blocks are welded to the crosspiece of the movable vise jaw as can be

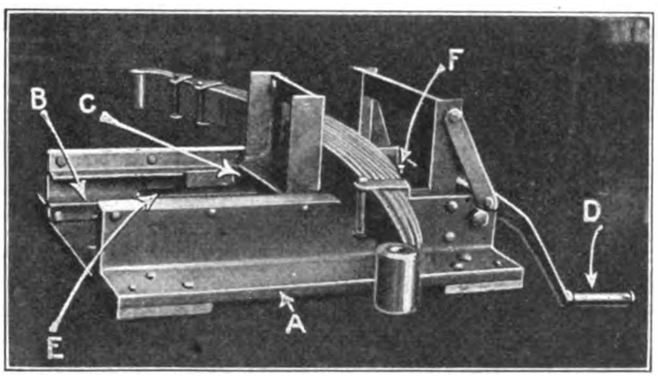


FIG. 1. A HANDY SPRING VISE

seen at *C*, so that the jaw will function properly when the handle *D* is turned.

The operation of this handle turns the screw *E*, which operates through a nut in the movable vise jaw, feeding the jaw in the direction desired. A solid collar is turned on the handle end of this screw, and a movable collar, held by the screw *F*, holds the screw in place while in operation. The feed screw is ¾ in. in diameter, 10 threads to the inch, and works very well.

Making Controller Segments

A fixture for bending copper segments for controllers on electric trucks is shown in Fig. 2. The copper bar from which the segments are made is ⅜ x ¾ in. The controller segments are from 1 in. to 7 or 8 in. in length, some nearly circling the controller. The tool consists of a round piece of steel *A*, turned to the correct diameter, to which the piece *B* is attached by two bolts and nuts, and the piece *C*, which turns on the pin *D*. The piece *C* is of ¾ x 2-in. stock, and a small piece *E* is attached by a small bolt as shown, to take the wear, and also so that the tool can be used for different thicknesses of stock.

In operation, one end of the copper bar is clamped to the tool by means of the clamp *B*, then the bar *C*

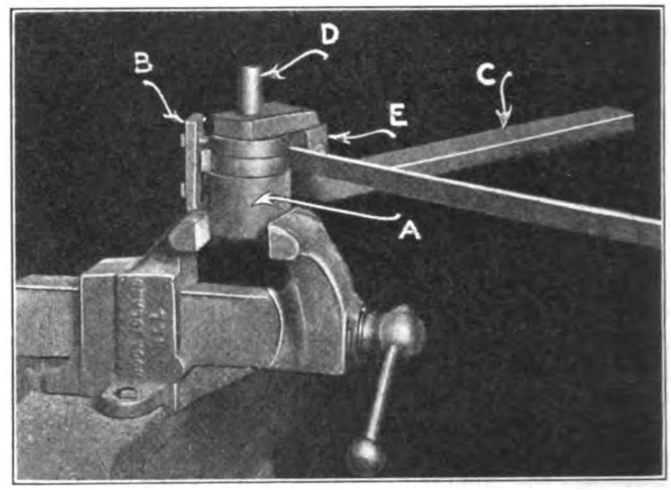


FIG 2. SEGMENT-BENDING TOOL

is pulled around, bending the copper bar to shape. The segments are then cut off to the desired length, after which they are laid out and drilled. After the segments are attached to the controller, the controller is put into a lathe and the outside is turned to size.

Home-made Truck Fenders

A method of making fenders for trucks is shown in Fig. 3. In actual operation, a truck is used for the job, but as no truck was available at the time the picture was taken, a wheel was used to demonstrate the operation of the tool.

Occasionally a fender has to be replaced, and the

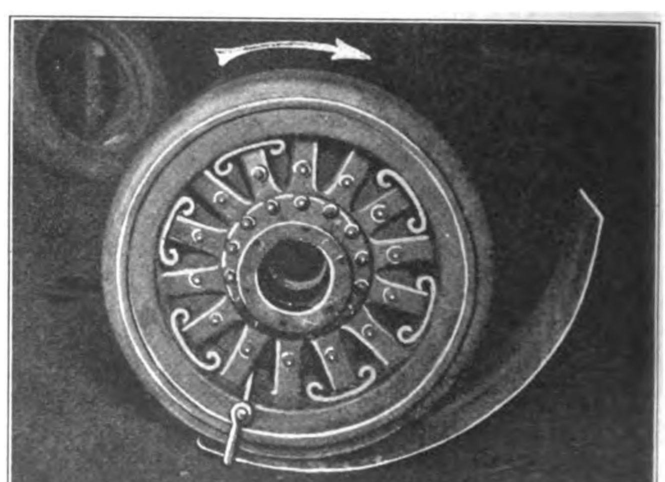


FIG. 3. MAKING A TRUCK FENDER

Express Company has found that time and money can be saved by making its own, and that the home-made ones are just as serviceable. The material for the fender is a piece of 3/16-in. sheet steel, 12 in. wide and

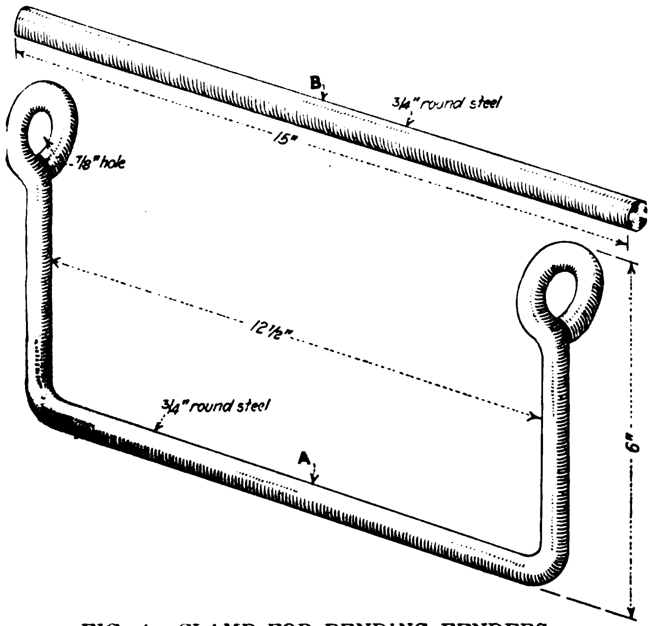


FIG. 4. CLAMP FOR BENDING FENDERS

4 ft. long. The tool is made of 3/4-in. round steel, bent as shown in Fig. 4. In operation, the piece marked *A* is put in place around the tire of the wheel, and the piece *B* is slipped through the eyes. Then one end of the piece from which the fender is to be made is slipped through the U-bolt, as shown. The fender is bent to shape by running the truck slowly forward in the direction of the arrow.

The Modern "Putting-on" Tool

A view of an operator using a "putting-on" tool is shown in Fig. 5, the job being that of welding metal on to a worn out torque shaft. This is done when a shaft

FIG. 5. A "PUTTING-ON" TOOL WELDING METAL ON A WORN OUT TORQUE SHAFT

becomes badly worn in one spot, and then the shaft is re-machined. The apparatus is an ordinary acetylene-welding outfit, and the operator is using an Imperial welding torch. By this means many pieces that would otherwise be scrapped are saved and used almost indefinitely at small cost.

An interesting operation with the welding torch is that of welding bronze into clevis holes. Fig. 6 shows a couple of clevises that have been welded in this manner. The faces are now disk-ground to give a smooth bearing surface, then the holes are laid out and drilled and reamed. This method of making bronze bushings is cheap and the bushings are durable.

The Running-in Stand

A home-made running-in stand is seen in Fig. 7. It consists of a motor stand, part of which is shown at the left of the picture, and a rack to which is bolted an old transmission. The motor and the transmission are connected by a universal shaft, and the whole outfit is run by power transmitted from the line shaft through a belt and pulley to the shaft at the right in the picture, which connects with the drive and countershafts in the transmission.

The motor stand is not bolted to the floor, as it has

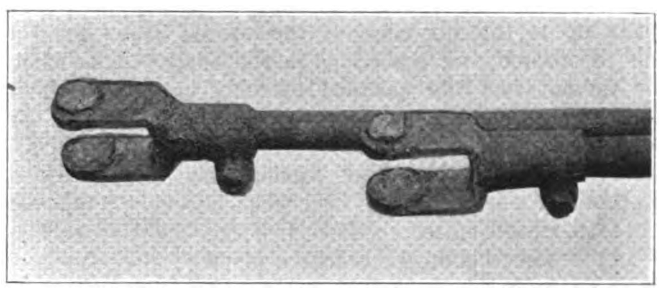


FIG. 6. BRONZE WELDED INTO CLEVIS HOLES FOR BUSHINGS

to be shifted to accomodate the different kinds of motors. The motor end of the universal shaft is made so that any one of a variety of adapters can be used, ac-

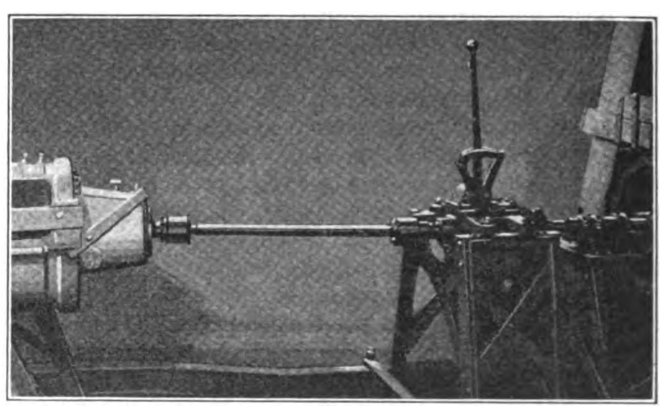


FIG. 7. A HOME-MADE RUNNING-IN STAND

cording to the make of motor, and the transmission makes it possible to run the motor in at all the various speeds for which it is built. The shaft by which the transmission is driven is a section of line shaft, running in an ordinary line shaft bearing. The stands to which the transmission and bearing are bolted are made of sections of 1/4-in. angle steel, bolted together. This outfit can be easily built anywhere, and is thoroughly efficient for the job.

The appliances shown indicate very plainly how the repair shop is growing to deserve the name "service station" more and more.

Methods of Machine Tool Design

Concluding the Second Article on the Design of a Special Machine—Effect of Considerations of Tool Wear, Speeds and Feeds

BY A. L. DELEEUW

SO far none of the things we have done clash with the original schedule we had laid out, but this latest change does, for our schedule item No. 2 says clearly, "mill top and pass cutter completely over work, bringing the cutter slide against a stop."

In order to meet the new conditions we will have to change the schedule as follows:

(1) Chuck piece.

(2) Mill top, bringing cutter so far that its center will come above the far edge. (The center of the cutter should be over the far edge of the work or a little further *if* the cutter has the same diameter as the width of the work which, by the way, is never desirable. In our case the cutter is ½ in. larger than the width of the work, so that it is not necessary to bring the cutter quite up to the far edge of the work. However, for our discussion and especially in the early stages of it, we do not feel the need of extreme accuracy. It is the process which is being presented and not the actual design of a machine.)

(3) Return cutter slide immediately and bring it up against a stop.

(4) Drill all holes.

(5) Loosen clamp and remove piece.

In order to be able to form a rough idea of the construction of the combination slide we make the sketch of Fig. 10, which shows the machine as far as we have it up to the present. It shows some of the features of the combination head, but not all of them. The milling cutter is shown, and the drill spindle is indicated, and it shows further a slideway along which the head can feed, and the stop against which it is to come to rest. We will now investigate what further features this head requires to make it function properly.

There must be a milling spindle with its drive, and this spindle must be adjustable in a vertical direction so as to make up for variations in the cutter. The amount of adjustment will be very small because only a small amount can be taken off the teeth of the cutter before it becomes useless. Probably ¼ in. would be enough, but as it is about as easy to make an adjustment of ¾ in. as of ¼ in. we will say, for the present, that we will provide for an adjustment of ¾ in. The drill head will be of a construction similar to the other drill heads but as the hole to be drilled is larger than the other holes we have considered so far it is quite possible that a somewhat larger head may be required. Besides, this drill spindle works in a vertical direction and we may find it necessary to change the construction correspondingly. However, the drill head will again have a spindle and a gear at the end of the spindle. There must be a long pinion, or perhaps a sliding gear, there must be a roller attached to the slide, and some means for adjustment just as in the other drill heads.

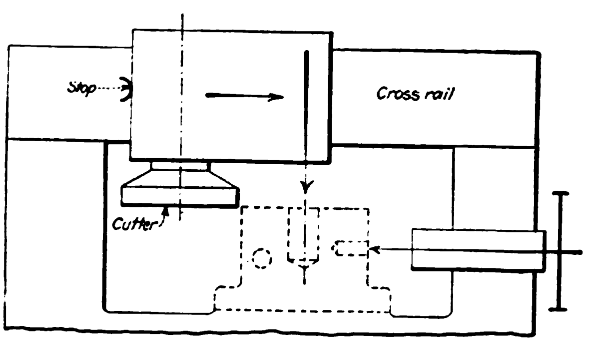


FIG. 10. PROGRESS SKETCH OF MACHINE AS OUTLINED

As the two units of this combination head are so close together (3¾ in. center to center) we will have to be careful and see whether it will be possible to have them so near each other. In order to find this out we will make a cross-section of the two spindle heads to make sure that there is no interference. See Fig. 11.

This sketch would really be drawn up after we are through with the following considerations, but it is shown here at this stage of the game so as to make the description of our process of reasoning easier.

We estimate the milling spindle to be 2 in. in diameter at the large end, to run in a bushing ¼ in. thick and to require not less than ¾ in. metal around the bushing.

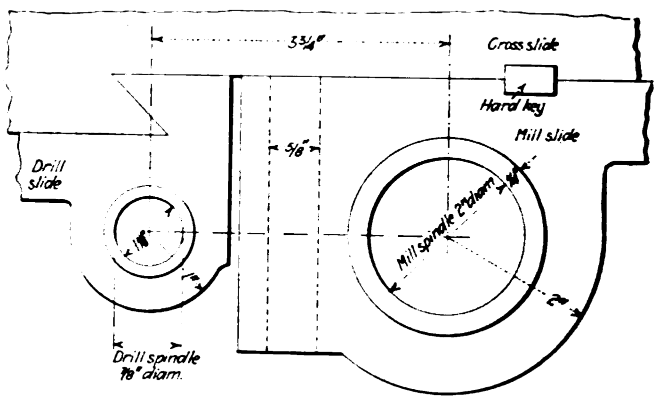


FIG. 11. SCALE DRAWING OF PARTS OF MILLING AND DRILLING HEAD

We would not be willing to get along with less. Similarly we estimate the drill spindle to be ⅞ in. in diameter, to run in a bushing ⅛ in. thick and to have not less than 7/16 in. metal around it. Doing this we have taken up 3 in. out of 3¾ in. available. Making a preliminary sketch of these figures we notice that we can increase the metal anywhere except on the side where the two heads approach each other.

The milling head has no feed up and down and only a small amount of adjustment. Not being required to feed, we need no slide and can guide the head by a key and keyway; and, the amount of adjustment being small, we can readily accomplish it by having slotted holes for the clamping bolts.

The drill head, on the other hand, requires feed and adjustment so that we will need a slide bearing. These elements are shown in Fig. 11.

As it stands now the milling head can be adjusted

up and down a small amount, it does not interfere with the drill head, and we can give as much metal around both spindles as we wish, being limited only on one side.

Another point where we may expect some trouble is in the drives for the two spindles which are so close together and we will therefore take this matter up as our next step.

As the milling cutter has to work on a rough casting, we should limit the cutting speed to about 70 ft., which means that the spindle must run 107 r.p.m. The drill spindle should run at the highest practical speed, because the time required for the second operation, the drilling of the holes, depends entirely on the time used by this drill; the other drills being smaller and drilling less deeply.

We should therefore run the drill as fast as practical and give it the coarsest practical feed. However, this being an automatic machine in which a number of tools are at work, it is not wise to go with feed and speeds as far as we might go with a hand-controlled machine in which only one tool works at a time, for the delays caused by the breaking down of a single tool are of more importance in this class of machinery. We will, therefore, limit our speed to 100 ft. per minute and our feed to 0.006 in. per revolution. This brings the speed up to 770 r.p.m. Having two spindles so close together it is but natural that we should think of driving both from one common source. Calling the drill spindle *A*, the milling spindle *B* and the common driving source *C*, the question is this: Shall we drive *A* from *C*, and *B* from *A*, or *B* from *C*, and *A* from *B*, or shall we drive both *B* and *A* from *C*?

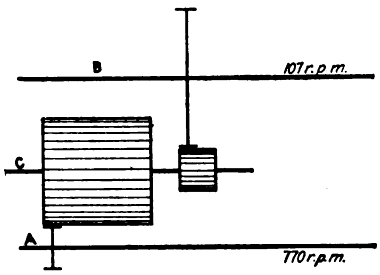


FIG. 12. SHORTHAND SKETCH OF DRIVE

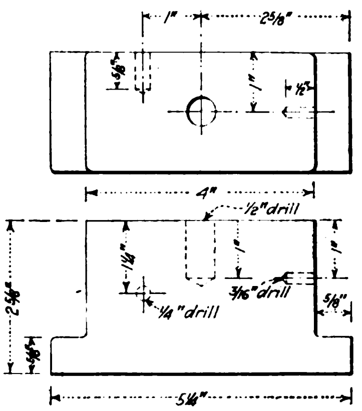


FIG. 13. DETAIL OF WORK

If we follow the first scheme we will have a reduction of about 7½ to 1 between *A* and *B* which is a greater reduction than can be accomplished by one set of gears. If we follow the second scheme, we would have to speed up in ratio of about 7½ to 1 which is entirely undesirable; so that it looks quite natural that, with the given proportion of speeds, we should follow the third scheme. Fig. 12 shows this arrangement sketched out in shorthand. With this arrangement *A* runs 770 r.p.m., *B* 107 r.p.m., and the question is, what will be a good speed for shaft *C*?

The range in speeds is $\frac{770}{107} = 7.2$. As a first possible arrangement we will give shaft *C* a speed of 320 r.p.m., which will give a speeding up from *C* to *A* in ratio of 2.4 to 1, and a slowing down toward *B* of 3 to 1. We may find later that it is desirable to change this speed somewhat, but the speed selected does not require a very large gear on *B* nor does it speed up much toward *A*, while it gives a very moderate shaft speed for *C*.

We now check up this driving arrangement to see if perhaps we have introduced an undesirable element. As no dimension or location has been decided upon and as we are satisfied with the speed for the time being, there is only one thing that can be wrong—the direction. Of course, we can make *A* run in either direction by giving the proper direction to shaft *C*, but we notice that *A* and *B* would necessarily run in the same direction. Is this right?

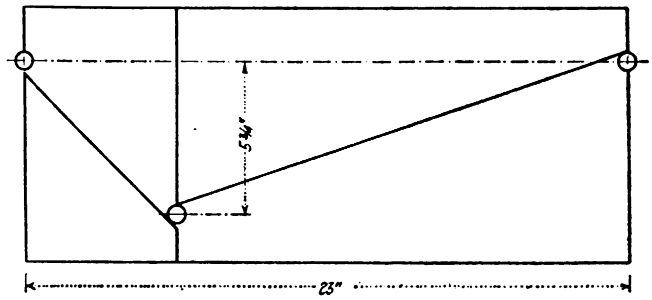


FIG. 14. MILLING HEAD OPERATING CAM

Looking at Fig. 9 we find that, if the milling spindle runs in a right-hand direction, the cutter will force the work against the stop, which is desirable. We will therefore make the milling cutter run in the right-hand direction which is the same as that for the drill spindle, and therefore the arrangement shown in Fig. 12 is correct in regard to directions.

We cannot very well go further with this arrangement of the drive without determining at the same time the sizes of gears, etc., which many be required, and it is still too early to determine detail sizes for them. As a rule detail sizes should not be determined until we have a complete preliminary idea of the entire machine, and this we have not yet. We said "as a rule" because now and then we will find an exception. If, for instance, we have to design a machine which must do extremely heavy work, then it may well be that the last element of the drive, for instance, the spindle or the last driving gear, is the controlling factor for our considerations. In such a case we should start out with an analysis of that drive, beginning with the heaviest member. But as a rule this condition does not present itself and the drive alone is merely one of the many functions of the machine, all of which should get due consideration before we analyze any of the details. For this reason we will go on to the next item of our general construction, namely the feed.

In Fig. 13 are shown the dimensions of the piece of work. It shows that the length to be milled is 4 in., as we already know; it further shows that the deepest hole to be drilled is 1 in. in depth, so that the distance which the drill spindle must feed is a little less than 1$\frac{3}{16}$ in. That is to say, if the drill point should touch the finished surface of the work it would have to go down 1$\frac{3}{16}$ in. to complete the hole. However, if we look at Fig. 9 and at our revised schedule we will see that the drill is over the rough surface of the work while the milling takes place. The amount of finish allowed on the piece is probably ⅛ in., but might be a little more in spots; so that we ought to allow not less than ¼ in. Besides, the drill point is not supposed to touch this surface; it should be a small distance above the work. We will therefore allow for a total amount

of feed for the drill spindle 1½ in. As to adjustment, we reason this way:

It would be possible to grind a ½-in. drill down for a length of 3 in. before it would have to be scrapped. And so we would have to give 3 in. adjustment to the spindle. The greater the amount of adjustment the larger and clumsier the machine becomes, so that it is very desirable to keep this amount of adjustment down to a minimum. As all the drills we are using are standard sizes, which are always sure to be used in other parts of the shop, we will use up these drills only part way and then use them elsewhere

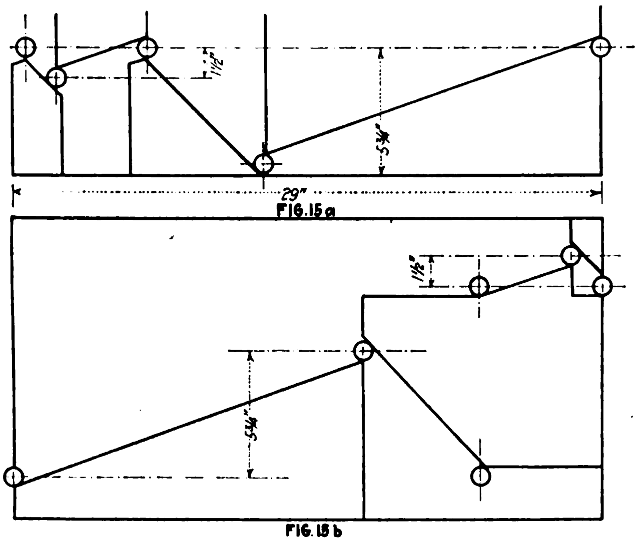


FIG. 15. TWO POSSIBLE ARRANGEMENTS OF CAMS FOR MILLING AND DRILLING

in the shop for some other purpose; and so we decide arbitrarily to limit the adjustment of the drill spindle to 1 inch.

We found that the amount of feed required for the combination head is 5¾ in. and the question is now: In what way shall be provide this feed and how shall we provide the necessary feed for the vertical drill spindle?

Here, again, we have the same condition we found with the horizontal drill spindle, namely, that we always have to feed the same amount and always at the same rate, so that a cam would meet our conditions very well. Besides, the fact that we have already decided to use cams for the horizontal drill spindles makes it probable that at least a part of the feed arrangements for these spindles can also be used for the vertical drill spindle and the milling spindle. Following our system of taking up only one thing at a time, we will first consider the conditions of the cam to be used for the milling spindle.

The amount of feed is 5¾ in. and so is the amount of return. There is no rapid advance. If we should use a drum cam for this feed and make the slope for the strip which does the feeding 1 in 3 and the return cam with an angle of 45 deg., we would obtain a cam represented by Fig. 14. We would find that the circumference of this cam, measured on the pitch line, would be about 23 in.; and its diameter about 7⅜ in. After this cam has done its work the cams for the various drill spindles must begin to act and we are confronted with the question: Shall we make the milling cam stop while the drill cams do their work, or shall we let all cams run continually?

If we should follow the second plan, the milling cam must have the same diameter as if it were first feeding the milling spindle and then the drill spindle; in other words, as if a second cam for the drill feed were added to our diagram of Fig. 14. Two arrangements are shown in Fig. 15; and we would find that in either case the pitch diameter of the cam would have to be 9¼ in. This would make a very simple construction provided, of course, that it would be possible to use this cam for the drill feed; and before we can make a decision we must look into this matter and see if it is possible to make a construction which will permit of the use of one and the same cam for milling and vertical drilling.

If we should imagine that we have carried out this plan, then the cam used for this purpose must do the following: It must first feed the milling spindle 5¾ in., then return it and, during all this time, keep the drill spindle immovable; it must then feed the drill spindle and return it and, in the meantime, keep the milling spindle immovable.

The main difficulty we would meet here is that the drill spindle with its slide and roller must move sideways while the milling feed goes on, and yet this sideways movement must have no effect on the drill feed.

For the present we will imagine that we have found a proper solution for this problem which, by the way, will be taken up in a later chapter. Having solved this problem, the question still remains whether it is advisable to have the cams for the drilling stand still while the milling goes on, and vice versa, or whether all cams should turn all the time. We found that the cam required for the combination slide has a diameter of 9¼ in., and, as the amount of feed required for the horizontal spindles is but very little less than for the vertical spindle, we may expect that we will need cams of the same size (or approximately so), for the horizontal spindles. This means three rather large cams for this machine.

On the other hand, should we follow the first plan, we will have quite a complicated system of control because the schedule of operations would be as follows:

(1) Milling cam turns, causing feed and return, then stops; for which purpose a trip must be operated by this cam itself or by something running in unison with it.

(2) This same trip starts the drill cams which make one complete revolution for feed and return, at the end of which they trip themselves out of action and not only that, but they must also trip the entire feed mechanism out of action, so as to give the operator a chance to chuck a new piece.

We will leave the solution of this problem, also, to a later chapter when we will be able to judge better as to which is the preferable method under these or other circumstances.

We can readily see that it will not be possible to make much further headway with our machine unless we now begin to sketch out some of the items in greater detail. And before we do that, we will make a study of the various functions and mechanisms which are commonly used in the construction of machine tools. When we have analyzed some of the detail constructions, we will return to our original schedule and sketches and make them more and more complete, remembering that they are the most important documents we have, as they represent the succession of steps in our process of reasoning.

Use of Optical Instruments in Machine Work

Microscope and Projector Used to Check Location and Contour of Work—Accurate Gear and Rack Cutting—An Eyepiece With Radial Lines

SPECIAL CORRESPONDENCE

ALTHOUGH the ordinary magnifying glass is perhaps the most common optical tool in universal use in the country today, the mechanical trades in general have not taken advantage of the possibilities of the more extended application of optics to their work. When we stop to consider the enormous advantages of using a light beam with its absolute rigidity, lack of inertia, friction and mechanical defects, as a multiplying lever; and combining with it as a unit of measure, the light wave with its unfailing constancy of length, we must conclude that we have ideal agents to help us bring about that most desirable aid to manufacturing, economical interchangeability.

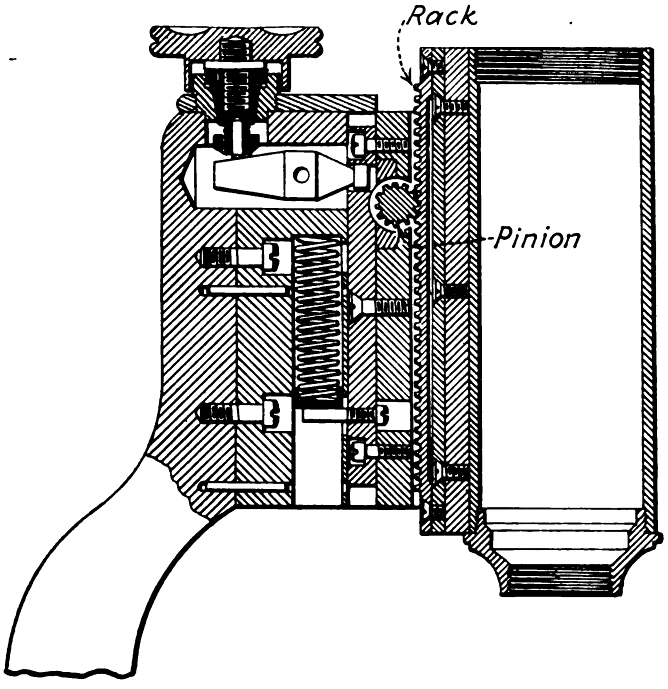


FIG. 1. ASSEMBLY SHOWING RACK AND PINION.

During the last half century the Bausch & Lomb Optical Co., Rochester, N. Y., has studied this problem thoroughly and today is using many applications which will no doubt be of much interest to industry as a whole.

The small spiral racks and pinions used in the focusing mechanism and mechanical stages of precision microscopes have always been a bugbear to the mechanics engaged on this work. The requirements are very exacting, as a degree of interchangeability is demanded that will permit of an assembly showing no visible vibration of the greatly enlarged image when focusing the microscope equipped with its most powerful objective lenses. Fig. 1 is an assembly showing the culprits in the focusing mechanism. The rolling action should be perfect, which means that the form of tooth and spacing must be maintained to a high degree of accuracy; the pitch diameter of the pinion and the depth of cut in both pinion and rack must also be held very close so that the slides can be milled to standard dimensions and assembled without fitting; the tooth cut must be smooth so that no inequalities can be felt as the rack rolls on the pinion; and last but not least the angle of spiral must be correct so that when secured in place the bearing will come over the entire length of the teeth.

The circular master tool used for forming the pinion cutters is shown in cross-section in Fig. 2. That used for rack cutters is similar in construction. The first difficult step in the problem was to find a steel, heat-treatment and cutting lubricant that would enable the tool to hold a keen cutting edge long enough to form and back off a cutter with a smooth polished surface. Not only was it necessary to have the tool hold its edge, but its properties were required to be such that the fine chips formed when in action would not pile up and adhere to the edge sufficiently to scratch the surface of the cutter. The only way found to solve this part of the problem was to make up a large number of plain circular forming tools of the different steels to be tested, and turn off a definite amount of stock from standard cutter blanks with them, then examine their edges under a high power microscope and measure with a filar micrometer-eyepiece the extent of wear and the amount of material adhering.

By varying these tests, using different heat-treatments of both the forming tool and blanks, different steels for the blanks, and trying various lubricants, the proper conditions were found that would give most nearly ideal results. It was found that under the best conditions, no forming tool could be made that would wear less than 0.0002 in. during a test representing the work necessary to finish a cutter.

In Fig. 3 is shown the appearance of the edge of the cutter finally used at $50x$ magnification. Fig. 4 shows a $1,000x$ microphotograph taken of the etched cutter as an aid in reproducing the exact conditions in cutters to be made later.

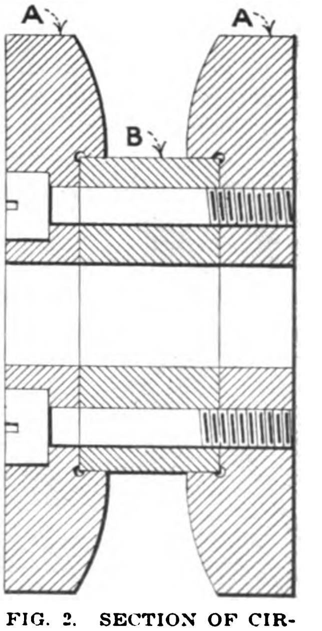


FIG. 2. SECTION OF CIRCULAR MASTER TOOL

In the construction of the master tool, the component parts are roughed out, heat-treated and ground on all surfaces. The formed surfaces of the side plates *A* are lapped on an epicycloidal generating machine, their contours being examined under high magnification on the contour projector shown in Fig. 5.

This projection apparatus and screen are self contained and use a compound microscope (in place of the ordinary projection lens) and a prism to reflect the light beam at a right-angle so as to obtain the maximum distance on a small instrument,

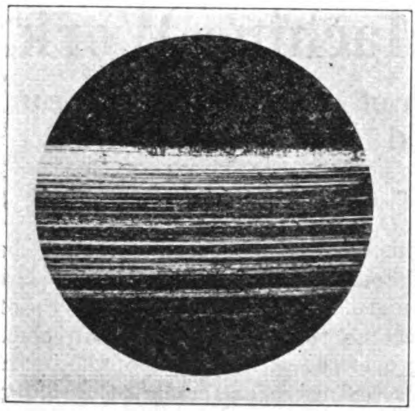


FIG. 3. MICROPHOTOGRAPH OF CUTTER EDGE AT $50x$ MAGNIFICATION

from the object to the screen. In Fig. 6 is shown a layout of the optical system used. The illuminant *A* is a 6-volt Mazda lamp, current for which is supplied through a 110-volt a.c. transformer. The condenser *B* is of aspheric form and when used in connection with the supplementary condenser *C*, gives as near parallel rays of light as possible. The iris diaphragm *D* allows the rays to be cut down to as small

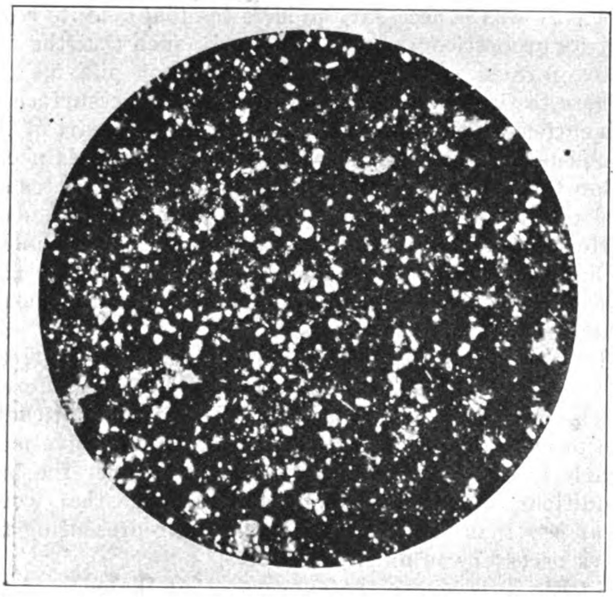


FIG. 4. MICROPHOTOGRAPH OF ETCHED CUTTER AT $1,000x$ MAGNIFICATION

a beam as may be desired. The rays pass through the object *E* (in the figure shown, a screw thread) into the objective lens *F* of a compound microscope. Beyond

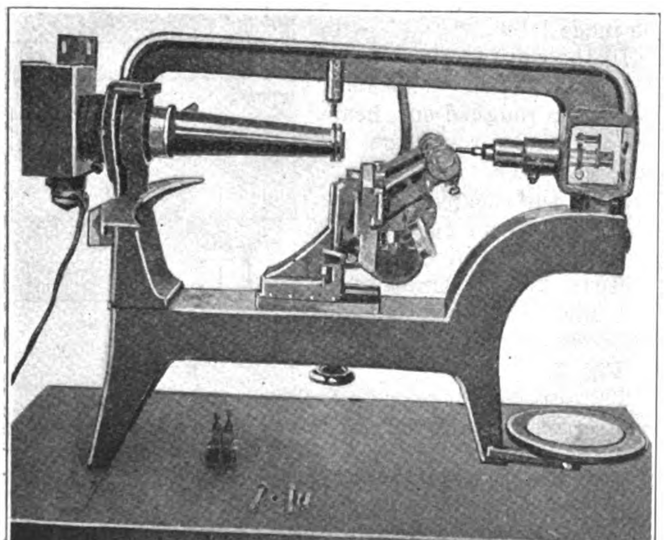


FIG. 5. CONTOUR PROJECTING APPARATUS

the eyepiece *G* is a right-angle prism *H* which reflects the light down upon the screen and forms the enlarged image *I*. It will be noted that the optical system is fixed and that focusing is brought about by moving the object back and forth on its side.

This apparatus was rigged up for shop use to overcome the disadvantages of the usual form requiring a

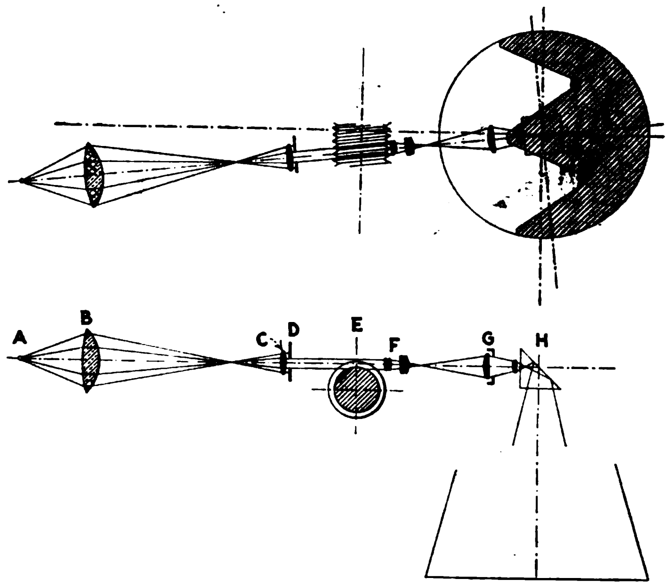


FIG. 6. OPTICAL SYSTEM OF THE CONTOUR PROJECTING APPARATUS

somewhat darkened room and a location free from excessive vibration. It can be placed anywhere in the shop and can be handled by one man without his running back and forth from the instrument to the screen.

The plates of the master tool, *A* in Fig. 2, are held on

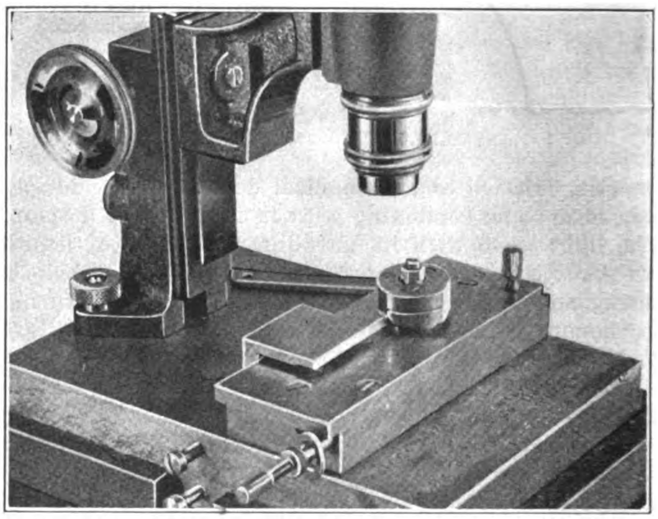


FIG. 7. GAGE FOR CHECKING THE MASTER TOOL

an arbor between centers and the image is projected against a master outline with which it must coincide. This is done at a magnification of $100x$ which makes certain of an exceedingly accurate tool if no visible error is apparent. The spacing block *B* being ground and lapped to proper thickness, the whole tool is assembled and the cutting edge sharpened to 0.180 in. below the center to give proper clearance. As a variation of shape at this particular section will deform the shape of the cutter, the operation is checked on the gage shown in Fig. 7. This gage consists of a stud over which the tool is held and a stop against which the

cutting edge is brought. A microscope with a straight line etched in its eyepiece is so mounted that the line represents the position of the cutting edge of the tool

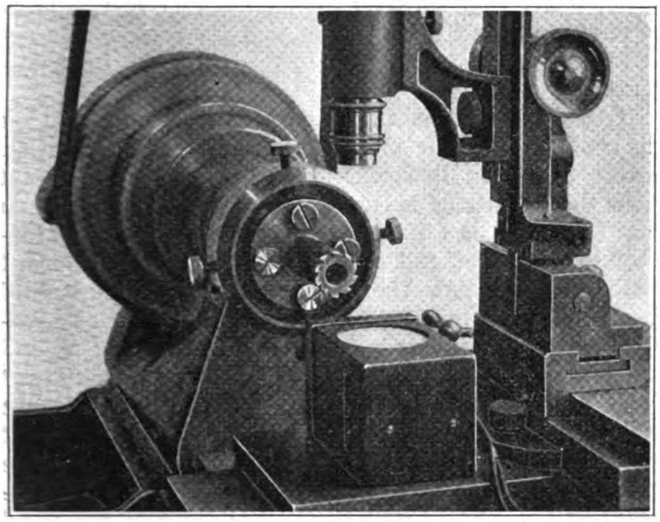


FIG. 8. CUTTER MOUNTED FOR GRINDING THE HOLE

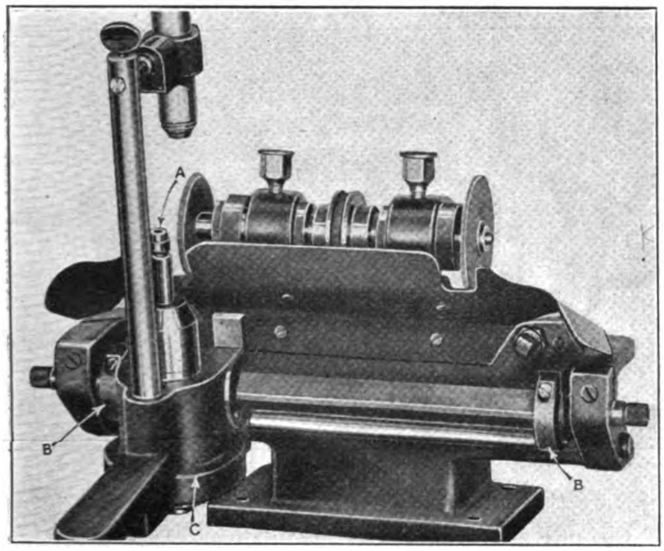


FIG. 9. MACHINE FOR GRINDING CUTTERS

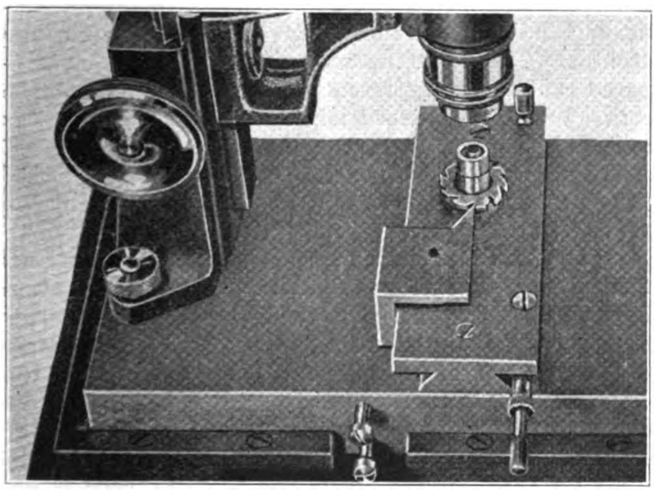


FIG. 10. GAGE FOR CHECKING RADIAL-GRINDING OF CUTTER

when properly sharpened. After this inspection, the tool is given a final examination on the contour projector, this time the instrument being focused on the cutting edge which will give an image shaped slightly different from the first inspection, due to the sharpening below the center. If the image coincides with the master on the screen, the tool is correct for forming and backing off the cutters.

The cutters are roughed all over and heat-treated and then a finish-forming and backing-off operation performed on a special backing-off machine. After this they are inspected for form, the same as described for the forming tool, and if found satisfactory are hardened and tempered. Notwithstanding the great care exercised both in the selection of steel and in the heat-treatment, distortion takes place to some extent and as no way has yet been found for lapping small relieved cutters of this kind, the errors of hardening must be eliminated in some other way.

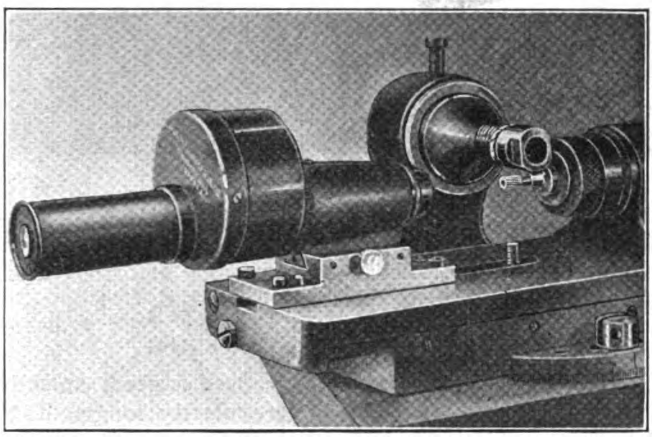


FIG. 11. OLD TYPE OF PINION CUTTING MACHINE

The answer to this problem is shown in Fig. 8. The cutter is fastened to an adjustable chuck by means of sealing wax and "wiggled up," while being observed under a microscope, until the teeth run true. The hole is then ground to size and one side of the cutter faced off to a fixed distance from the center line of the teeth. This distance is measured with the filar micrometer

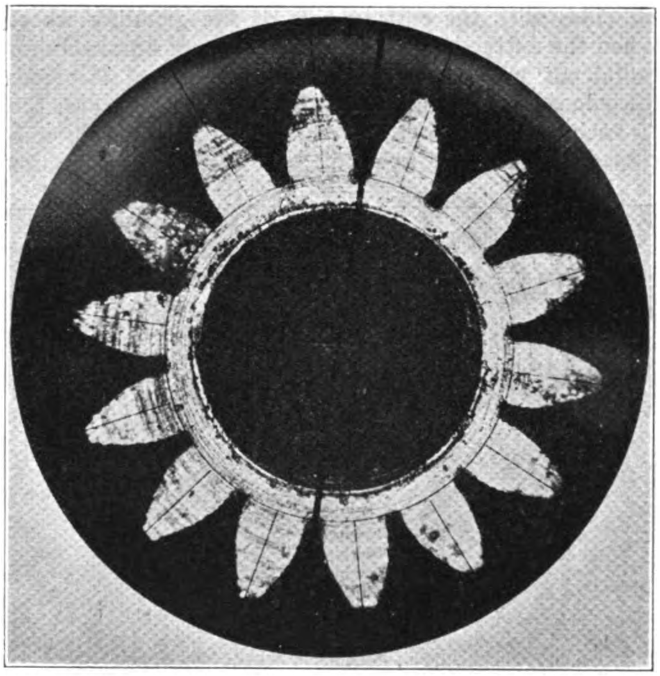


FIG. 12. PINION AS SEEN BY MICROSCOPE

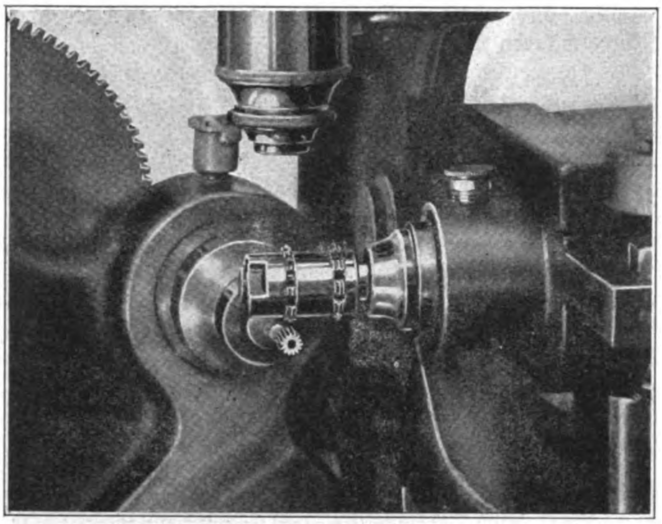


FIG. 13. LATE TYPE OF PINION CUTTING MACHINE

eyepiece on the microscope. The opposite face is then surface ground parallel to the first side and the cutter brought to the proper thickness.

The Problem of Sharpening

The operation of sharpening caused a great amount of trouble in the past due to irregularity in grinding, resulting in high and low teeth with the consequential roughness of cut. The problem was studied in the same light as in the previous operations and solved by the special machine shown in Fig. 9 and the gage shown in Fig. 10. In the machine a microscope is mounted on the arm carrying the index head in line with the center of stud *A* that holds the cutter to be sharpened. The stop *B* is adjusted so that the crossline in the eyepiece coincides with the cutting side of the grinding wheel. When the cutter is sharpened this insures an absolutely radial cut while the index under the guard *C* brings the edges into constant relation with the backing off of each tooth. It will be noted that the machine is rigged up with two grinding wheels, one for roughing

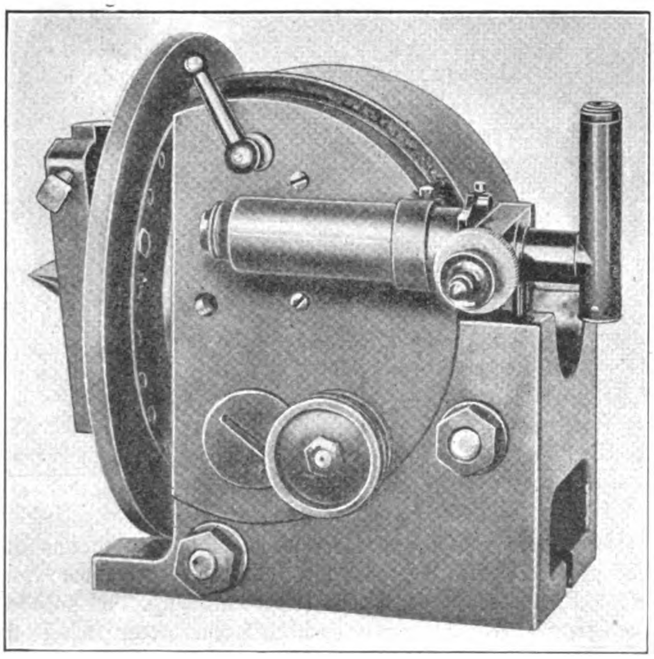


FIG. 14. DIVIDING HEAD FOR CUTTING ACCURATE INDEX PLATE

and one for finishing. The settings for both wheels are made in the same way with the arm resting against the corresponding stop.

The gage, Fig. 10, used for checking is very similar to one shown in Fig. 7, except that the crossline is set central with the cutter hole instead of 0.100 in. below center.

If the cutter passes this inspection it is again put on the contour projector and given a thorough examination before being put in stock. This final inspection must show that the shape is correct and in proper relation to face of cutter, the diameter correct, no "wobble" sideways, no rise and fall of the cutting edge of different teeth. Having now the proper cutters, the first and most difficult requirement in the manufacture of first-class racks and pinions is fulfilled.

The cutting of the pinions is done on two different types of machines, the older type is shown in Fig. 11 and the more recent one in Fig. 13. In the type of machine shown in Fig. 11 the pinion is roughed on one machine and transferred to a similar machine for the finishing cut. The cutter head can be moved back and forth to bring the center of cutter under the crossline

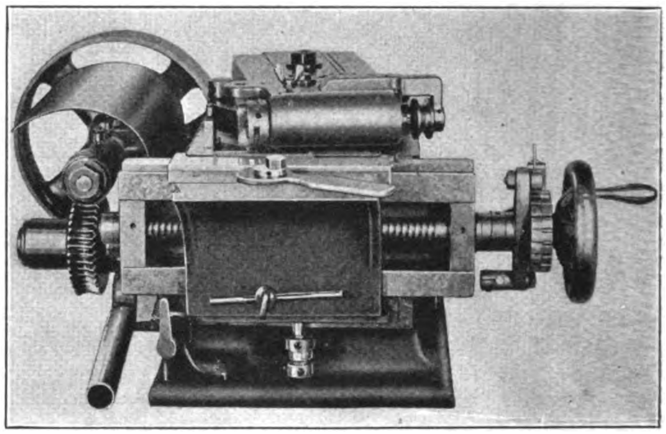


FIG. 15. RACK CUTTING MACHINE

of the microscope which is mounted on the center line of the workspindle. This insures the teeth being cut centrally. The microscope can be also used for inspecting and finishing product before it is taken from the machine. The crossline scale is etched with evenly-spaced radial lines representing the center lines of the teeth. When the finished job is observed it appears as in Fig. 12, which gives at a glance an indication of anything wrong with the set-up.

Roughing and Finishing the Pinion

In the machine shown in Fig. 13 the pinion is both roughed and finished. After the roughing operation the cutter head is moved to bring the finishing cutter into proper position for its work. Here in the same way as before, the microscope is set central with the pinion and the cutter stops adjusted to bring the cutters central. The index plates used on both types of machine were cut by using the dividing head shown in Fig. 14. The ordinary index plate on the head is replaced by a plate carrying index marks graduated on the dividing engine used for high-grade surveying and astronomical instruments. The microscope *A*, equipped with a prism tube to make more easy the observation by the operator, is used to set the lines on the graduated plate in position. This arrangement permits of extreme

accuracy. The gears used on the machine shown in Fig. 13 were also cut on this outfit to insure accuracy of the spiral to be generated.

The racks are cut on the machine shown in Fig. 15. The indexes of these machines are cut the same as those on the pinion cutting machines and the lead screws inspected for lead on the contour projector with the aid of a lead measuring attachment shown in detail in Fig. 16. This device consists of a micrometer head with a large graduated drum on the spindle and the spindle arranged to stop against a dial gage mounted in line with it. The micrometer is mounted on the movable slide which

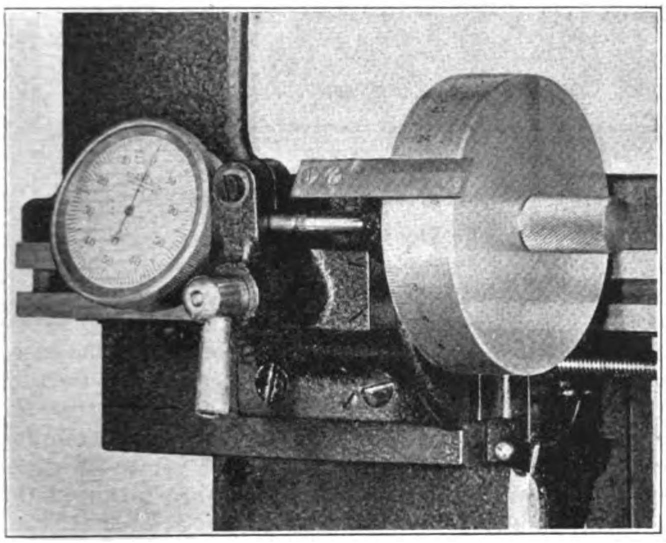


FIG. 16. LEAD MEASURING ATTACHMENT

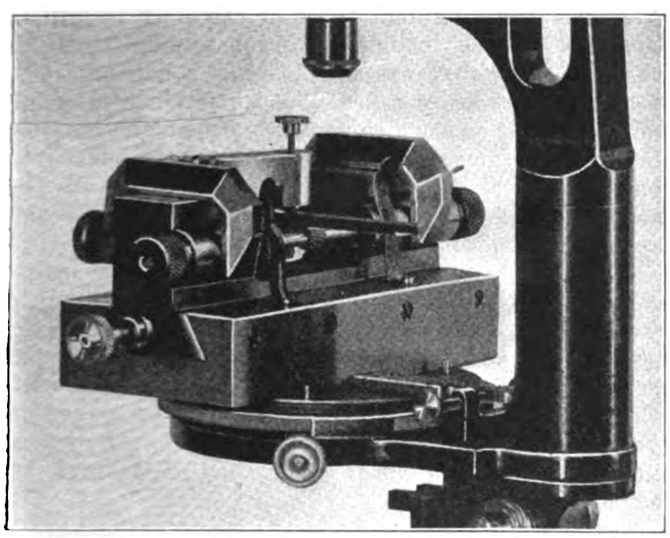


FIG. 17. CHECKING RACK AND PINION

carries the screw to be tested and the dial gage is mounted on the stationary base. The image of the projected thread is moved along so that one side of the V coincides with a master line on the chart and the amount of movement from thread to thread is measured by means of the micrometer, the dial gage simply acting as a zero point to avoid error due to sense of touch.

As a final check the indexing of the machine is inspected at intervals by fastening an accurately graduated bar on the bed of the machine and viewing it under the crosslines of a microscope mounted on the slide as the machine indexes along. The finished rack and pin-

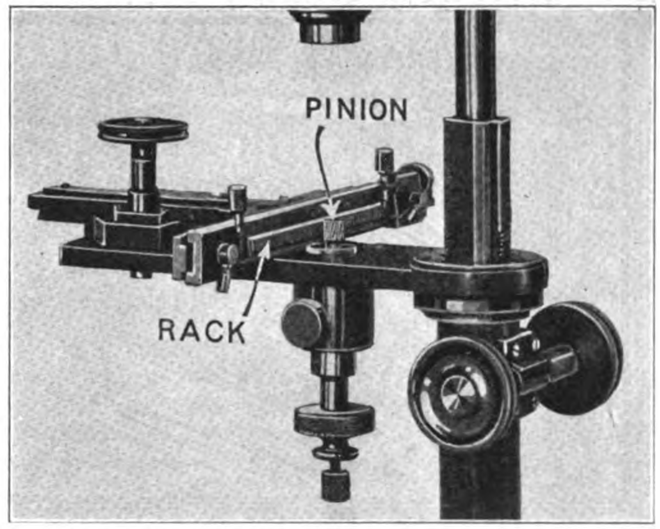


FIG. 18. OBSERVING ROLLING ACTION UNDER THE MICROSCOPE

ion, before being used, are placed in mesh on gages shown in Figs. 17 and 18 and the angle of spiral and the rolling action observed. The gage, Fig. 17, for checking the angle of spiral is constructed to hold the pinion between centers with the rack in mesh and held down by a slight spring pressure. A microscope with a crossline is so located that if the angle is correct, the side of the rack will coincide with the line.

The gage shown in Fig. 18 consists of a fixture to hold the parts to be tested in position, the rack being mounted on a slide that can bring it up into mesh with the pinion. The pinion is mounted in a bearing so that it can be revolved by means of a button. A microscope is mounted above the point where the mesh occurs and the rolling action observed directly.

Periodically, a pair of members is projected and photographic records, Fig. 19, made and filed for future reference.

Only after years of patient work in the development of the methods described was it possible to produce work that could be assembled without fitting and lapping. Not only was the aid of optics necessary to produce the required accuracy, but it was also needed to bring about a speed of operation and inspection that was commercially imperative.

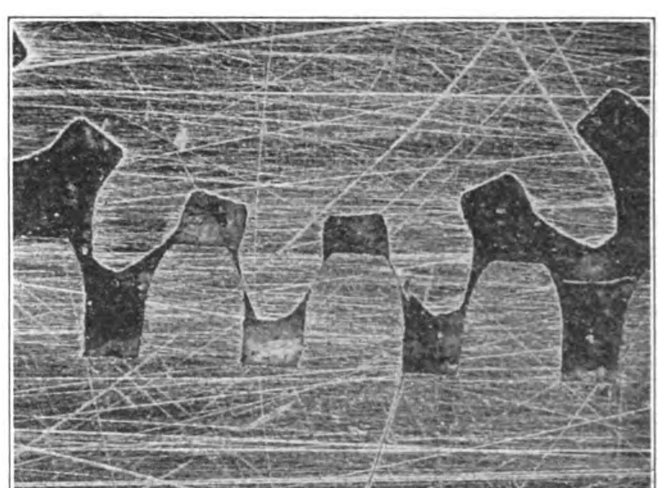
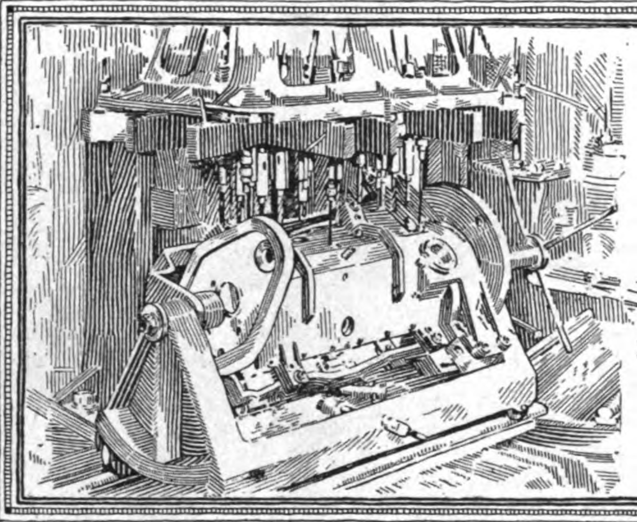


FIG. 19. PHOTOGRAPH PROJECTION OF RACK AND PINION



Tool Engineering

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Methods Employed in Designing Tools for Turret Lathes—Use of Layouts and Sketches—Familiarity with Machines Necessary for the Designer

THE methods of manufacture used on turret lathes should be determined by the tool department, and not by the department foreman. If the tool department has not sufficient knowledge to do this, a capable man familiar with this class of work should be obtained as soon as possible. Factory procedure varies in this matter; some believe the department foreman the best man to make "set-ups" for various jobs; others believe that the work can be done more profitably by the tool engineering department. We do not wish to argue the points, but will content ourselves with the statement that turret lathe departments in which the work has been properly planned and tooled by a capable tool engineer familiar with this kind of work, show a production far in excess of that obtained when the department foreman is responsible for the methods of tooling.

This statement is not intended to reflect on the department foreman in any way, as his province is not to provide tools and study methods of handling, but rather to produce the work with tools which are furnished to him. Jigs and fixtures are designed by the tool engineer, and there is no valid reason why turret tooling should not be handled in the same manner. As a matter of fact, the principal reason why a turret lathe department foreman is often called upon to make turret lathe set-ups is because the tool engineer has neglected this important phase of his business, and is therefore not capable of doing the work properly.

Lack of specific knowledge regarding the operation of turret lathes is one of the principal reasons why tool engineers often feel "out of their depth" when methods of handling work on turret lathes are to be considered. By consistent study of various turret lathes and by getting into the shop and operating the machines, a tool designer can soon obtain sufficient knowledge to enable him to grasp the important points connected with the arrangement and use of turret tools. No branch of tool engineering is more interesting and instructive than turret lathe work, and the field is wide enough to allow a capable man to rise rapidly if he specializes along this line.

One of the first considerations in making a turret layout is a knowledge of the machine which may be selected or specified on the operation sheet. In some cases the selection may be left to the tool engineer. Certain types of machines are generally considered better for roughing operations, but there is no good reason for this except the power of the machine; yet we find the opinion prevailing that certain types are unsuited for accurate finishing.

At the risk of being considered too broad in our statements, we say that in our opinion the accuracy obtainable from different types of machines is largely dependent on the tooling, always assuming that the machines themselves are in first-class condition. The tool engineer who is called upon to produce accurate work on a type of machine generally considered suitable for roughing, must design tools so as to take into consideration the possibility of inaccuracies in the machine. This can be done by piloting all tools and providing them with accurate adjustments.

Familiarity with the ratio of cutting feeds and speeds on a given type of machine is of considerable assistance when making a turret layout. The cross-slide and turret feeds are often working at the same time, so that the tools on turret and cross-slide are approaching each other. The feeds used can be proportioned so as to avoid interferences. In a grooving operation the cross-slide feed would be much finer than if turning or facing.

The feeds for different materials and in various kinds of cutting operations will be treated separately, but the tool engineer should familiarize himself with the subject in order that his designs may be consistent. Actual shop practice is of great assistance in this regard, and the man with first-hand information, gained by actual work in the shop, has a decided advantage over another not so well posted.

Turning, boring, facing and grooving operations are often done simultaneously in order to obtain maximum efficiency. The highest production is obtained by continuous cutting, thus doing away with idle time of the machine. In making the tool layout the expert engineer takes special pains to design tools that take advantage of multiple cutting, thus removing the stock as rapidly

as possible. On thin work, which is likely to be distorted, it is a good idea to take all roughing cuts before any finishing is done. After the "skin" on the casting has been removed, the internal stresses are relieved and there is less likelihood of distortion in the finishing cuts. If, however, only a part of the work is roughed off when finish cuts are taken, the work may change slightly after the final roughing cuts are made, thus causing inaccurate work.

The matter of interferences of tools with each other or with portions of the machine while indexing has been mentioned in a previous article. The tool layout should be so made that any interferences will be clearly apparent, and suitable remedies can be applied. Care should be taken to show all tools in their actual positions with relation to each other, usually at the completion of a cut.

If turret tools are turning and boring while cross-slide tools are facing, it is advisable to show the turret tools in the position that they would be in at this stage tools in the position that they would be in at this stage of the operation. In other words, if the turret feed is 0.040 in. per revolution while the cross-slide is grooving at 0.007 in. feed, the turret may complete its work be-

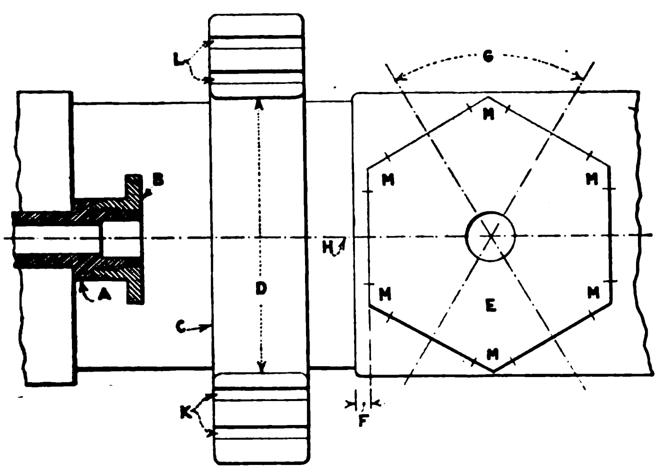


FIG. 373. TOOL ENGINEER'S MASTER LAYOUT FOR TURRET LATHE

fore the cross-slide tools have finished. In this case it may be possible to bring up the tools on the next turret face and put them into operation before the grooving has been finished. These points should all be considered in making a turret layout.

The first step in tooling a piece of work on a turret lathe is to make a sketch to show the general method used. This sketch is usually made freehand by the tool engineer, and it is used as a guide in the design of the necessary tools. The procedure varies; some men favor the design of tools first and after this make a layout to scale, while others first make the layout and design the tools from it. The latter method is much to be preferred, but it requires a capable man to make the layout, one who really designs the tools roughly while making the drawing. Such a man, who is thoroughly familiar with the machines on which he is working, can rough out several complete layouts in a day to approximate scale.

In order to carry out this layout work to advantage and obtain the best results, layouts are most commonly made on tracing paper under which has been placed a scale drawing of the turret, spindle and cross-slide in their respective positions. The master drawing may be made to $\frac{1}{8}$, $\frac{1}{4}$ or $\frac{1}{2}$ size, according to preference. The $\frac{1}{4}$-size layout is often used and will be found all right for a large proportion of the work. Fig. 373 shows a master sheet used for this purpose. If a number of types of machines are in general use, it would be necessary to have a master sheet for each machine. As this sheet is used frequently, it is advisable to make it in ink on tracing cloth. The center lines should be well defined, so that they can be clearly seen when tracing.

In the example, the spindle *A* is shown in section and an adapter *B* of standard form is mounted upon it. It is only necessary then for the tool engineer to place his chuck or fixture in the correct position on the spindle, either screwing it in place or mounting it on the adapter. The cross-slide *C* is shown full length, and the distance *D* is laid out according to the dimensions on the machine. T-slots are shown at *K* and *L*, so that when tools are applied to the front and rear of the cross-slide they will be in their exact relation to each other.

The turret shown at *E* has all the center lines shown at *G*, in order that tools may be placed in their proper positions. Center lines at *M* on each turret face indicate the position of bolts used to fasten the tools to the faces of the turret. The line *H* is very important, as it represents the center line of both spindle and turret. On certain types of machines the base of the turret slide extends a short distance ahead of the face of the turret, as shown at *F*. As this projection would strike the cross-slide, it should be clearly indicated as at *F* in order to prevent interferences.

A master sheet of this sort is of great help when making turret layouts, and it can be made in a size suitable for the finished layout or for the freehand sketch. There is much less likelihood of errors in proportioning tools when the tool engineer who plans the work has a sheet of this sort to use as a guide. Freehand sketches are often more or less out of proportion, and this fact sometimes causes trouble when making the final layout.

In Fig. 374 is illustrated a freehand sketch with notes, as often made by the tool engineer. The work shown at *A* is a flange which is to be turned, bored,

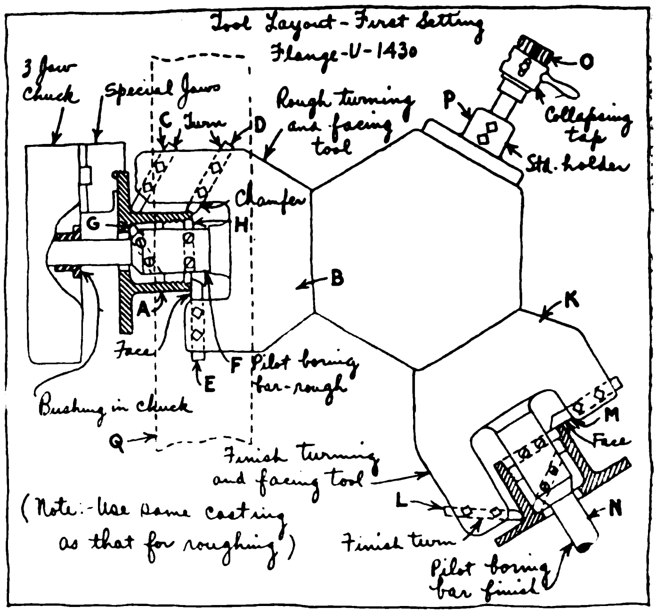


FIG. 374. TOOL ENGINEER'S FREEHAND SKETCH OF TOOL EQUIPMENT FOR TURRET LATHE

chamfered, faced and threaded. The turning, chamfering and facing operations are accomplished by using a special turning and facing tool *B*. The tool *C* does the turning, *D* cuts the chamfer on the end of the work and *E* faces the end. A boring bar *F* is piloted in a

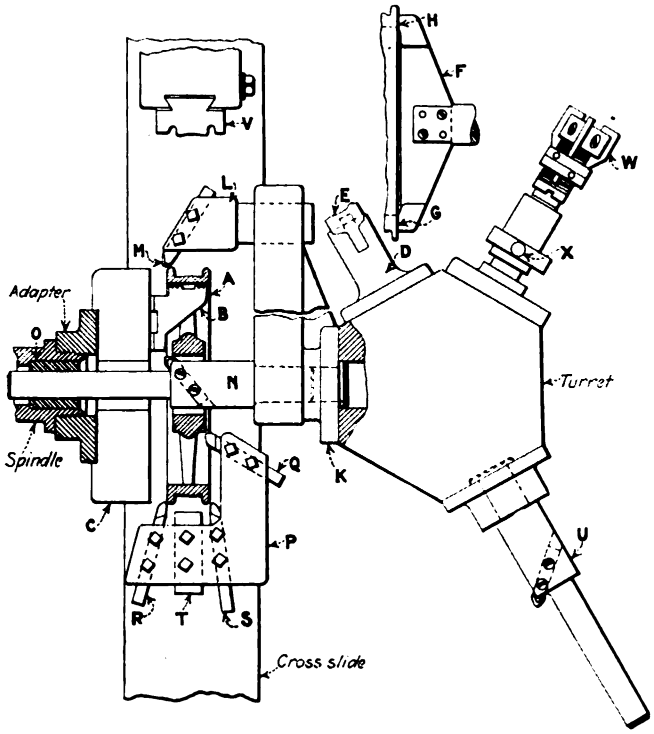


FIG. 375. TOOL LAYOUT FOR GROOVED PULLEY

bushing in the chuck. This boring bar has two tools *G* and *H*, the former doing the boring while the latter cuts a slight recess at the end of the work.

The finishing tool *K* is provided with turning and facing tools at *L* and *M*, respectively, and a finish-boring bar *N* is used in connection with these tools. The thread is cut by means of a collapsing tap *O* mounted in a standard holder *P*. The cross-slide of the turret lathe is not used in this setting, but it is necessary to build the various tools with sufficient overhang so that there will be no interferences. The position of the cross-slide is shown by the dotted lines at *Q*.

This last point is very well worth thinking about, as it is not at all convenient to remove the cross-slide completely on any type of turret lathe and there is not usually sufficient clearance so that it can be moved back out of the way under the chuck. The freehand layout shown contains a number of notes to guide the tool designer in his work. The various tools are briefly specified in writing, so as to make the matter clear to the designer.

In order to make the various points of importance clear with respect to turret tool layouts, several examples will be given here with explanation to cover each particular case. Fig. 375 shows a tool layout for a horizontal turret lathe used in machining the grooved pulley *A*. In considering this layout let us first examine the work, noting that both sides of the flange are finished and that the hub is bored and reamed. The grooved portion of the pulley is also finished. It is desirable to complete the work in one setting, and the tool equipment is designed for this purpose.

The work is held by the inside in special jaws *B* in a three-jaw universal chuck *C*. These chuck jaws are cut away so that the facing tools can pass by and finish the edge of the flange without interference. The method of setting up this work is by means of a chucking spider shown at *D*. This spider is so arranged that the portion *E* stands vertically, as shown in the side view at *F*. It bears against the edge of the casting at *G* and *H* and assists greatly in straightening it up while the chuck jaws are being tightened. The work is placed on the jaws slightly in advance of the position which it will take when machining. The jaws are then brought up lightly on the inside of the work, and the turret is moved forward by hand so that the chucking spider comes against the face of the flange and pushes it on the jaws to a distance predetermined by setting a stop on the turret slide. After this the jaws are tightened sufficiently to hold the work.

The holder *K* is fastened to the first turret face and contains a toolholder *L*, in which the tool *M* is used for turning the outside diameter. A boring bar *N* is used at the same time, and the end of this bar is piloted in a bushing *O* in the spindle. The turning tool is really in a vertical position, but is shown horizontally in order to illustrate the action clearly in one view. While the boring and turning operations are going on, a special toolblock *P* on the front of the cross-slide is used for facing the hub with a tool *Q*. Two other tools *R* and *S* face the sides of the flange, while the wide tool *T* roughs out the bottom of the groove.

The next operation is finish boring of the hole by means of another piloted bar, shown at *U*. While this operation is going on the dovetail forming tool *V* at the rear of the cross-slide is put into operation to finish out the groove. The final operation on the work consists of reaming the hole with an adjustable reamer *W* in the floating holder *X*.

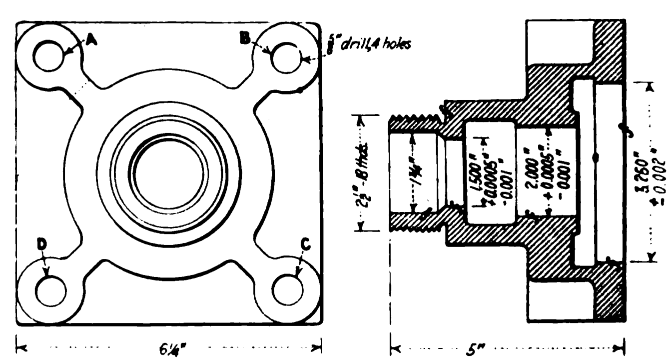


FIG. 376. WORK REQUIRING TWO TURRET LATHE OPERATIONS

The toolholder *K* is a standard type and can be purchased in considerable variety in the open market. The adjustable reamer is also a standard make, but the other tools shown must be built specially to suit this particular piece of work. It is advisable to use standard tool equipment for turret lathe work when possible, providing the production can be kept up to the maximum. When work is out of the ordinary and heavy cutting is necessary, special toolholders are often required.

The work shown in Fig. 376 requires two turret lathe operations, and both layouts are shown in order to illustrate the method of handling. The base of this casting is square and there are four holes *A*, *B*, *C* and *D* as shown. In deciding upon a method of handling, it seems advisable to use a chuck for the first operation

if possible, as it makes the setting up so much easier. The holes through the center of the piece must be concentric, yet they cannot all be machined in the same setting. The method of handling, therefore, must consider two settings and the location for the second operation must be such that concentricity in the holes can be obtained.

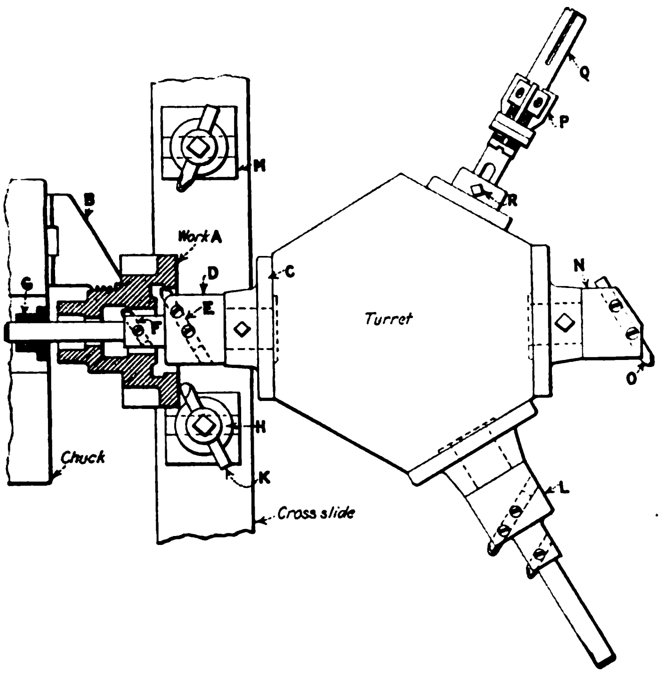


FIG. 377. FIRST LAYOUT FOR PART SHOWN IN FIG. 376

In Fig. 377 is illustrated the method used for the first setting. The work *A* is held by the outside of the hub in special jaws *B* in a three-jaw chuck. End location is obtained by the position of the work against the end of the chuck jaw. The toolholder *C* is used on the first turret face to hold a double boring bar *D*, in which are two tools *E* and *F*. The bar is piloted in a bushing *G* in the chuck. While this boring operation is going on, a standard toolholder *H* on the front of the cross-slide is used with a tool *K* for rough-facing the flange.

The second operation is identically the same as the first, except that the boring bar *L* is used for finishing two diameters in the hole while the facing tool *M* finish-faces the flange from the rear of the cross-slide. A reference to the work will show the dimension 3.250 ± 0.002 in. This is not a very accurate dimension, but the 2-in. hole is held close to size. In order to avoid the expense of a reamer for the large hole, a special boring bar *N* with a single-point tool *O* is used for sizing this hole. The final operation on the work in this setting consists of reaming the 2-in. hole with an adjustable reamer *P* having a pilot *Q* and being held in a floating holder *R*.

After the first turret lathe operation, the work is placed in a drill jig and the flange holes *A*, *B*, *C* and *D* are drilled. This operation is done between the two turret lathe settings in order to provide an effective method of driving for the second operation. It would be possible to do the drilling at another time and use a pin against the side of the casting to assist in driving, if for any reason the drilling operation would be inconvenient and require a great deal of extra handling.

In setting up for the second operation, the work is located by the plug *A* in the 2-in. hole, Fig. 378. A special faceplace fixture *B* has four hardened studs in it at *C*, and the face of the flange rests on these studs. The work is clamped in place by four straps *D*, and there are two pins (not shown) which enter the holes drilled in the flange and act as drivers. The holder *E* contains a bar *F* in which are two tools for boring the 1.500 and 1¾-in. diameters. This bar is piloted in a hole in the end of the locating plug, in order to preserve the alignment between the various holes.

The toolholder *E* has a vertical extension *G*, in which are two turning tools *H* and *K* for turning the outside diameters. This turning toolholder is shown in a horizontal position because it is more convenient to represent it in this way. The front of the cross-slide carries a toolblock *L*, in which the two tools *M* and *N* are set in such a position that they will face the shoulder and the end of the hub, respectively.

The second operation on the work is done by a holder *O* of similar form to that just mentioned. The tools carried in it are finishing tools for the same surfaces as those previously machined. The rear of the cross-slide is equipped with a block *P* carrying a tool *Q*, which finish-faces the shoulder and cuts a recess for the thread. The tool *R* finish-faces the end of the hub.

The next tool used is a reamer *S* carried in a floating holder *T*. This reamer sizes the 1.500-in. hole and is piloted in order to preserve the alignment. The final operation on the work is done by means of a diehead of the opening type, shown at *U*. Care must be taken in using large dieheads for cutting threads to make sure that the capacity of the machine is sufficient to permit the diehead *to swing over the back of the turret slide* when indexing.

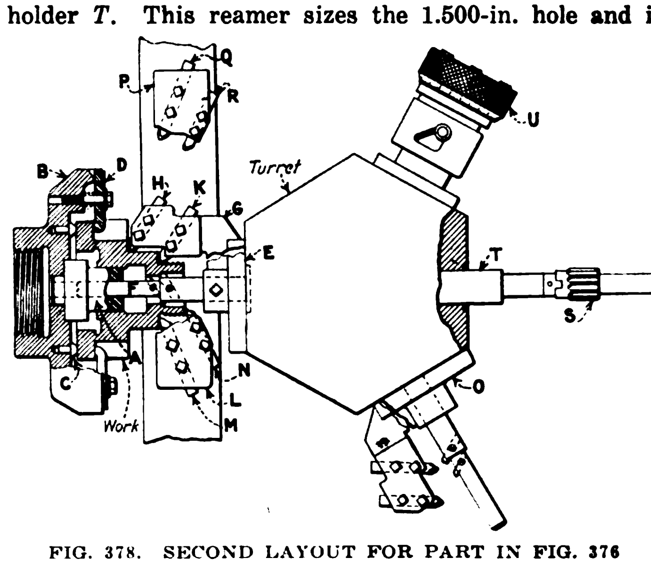


FIG. 378. SECOND LAYOUT FOR PART IN FIG. 376

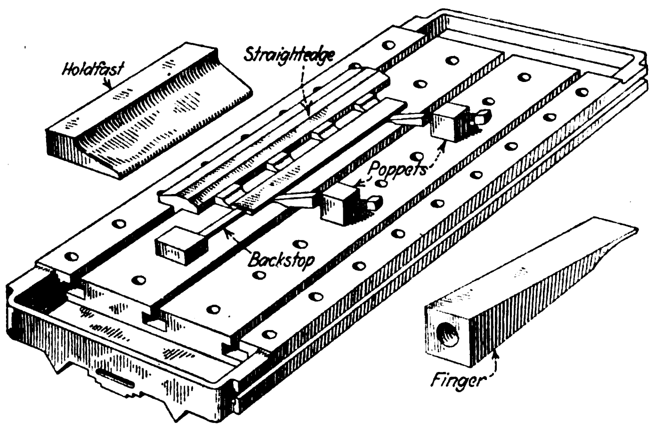
Planing Flat Gibs

By Harry Senior

The article appearing on page 219 of American Machinist under the title "Planing Flat Gibs," is of interest to the mechanic for several reasons. The introductory sentence in reference to the importance of devoting proper attention to clamping methods, is indubitably correct. The statement that there are many planer hands that have not grasped this fact, is open to question.

It would seem to me that any man who had worked long enough on a planer to be entitled to the designation of planer hand would have demonstrated to himself the importance of clamping methods, for the reason that unless his work was of a very rudimentary nature it would otherwise be impossible for him to obtain results that could be assembled.

Though I have seen many planer hands that did not know *how* to clamp an unfamiliar piece without springing it, I have yet to see a man who has worked more than a week upon a planer who did not thoroughly understand that if a piece was sprung in clamping, it would not be straight when released.



HOLDING THIN NARROW PIECES FOR ACCURATE PLANING

That the object to be attained in clamping work is to prevent it from shifting under the cut cannot be gainsaid. This tendency to shift must be guarded against in all directions. Not only must a sturdy backstop be interposed against endwise movement and suitable clamps used to prevent the work from being shifted sidewise, but it must be held *down* as well; and the necessity for resistance to a lifting moment, as well as the difficulty of applying it, increases in inverse ratio to the thickness of the piece.

Cost of Experiments in Trying to Plane Thin Work on a Production Basis

Anybody can, without difficulty, plane parallel a piece of iron 14 x 18 in. in size and 6 in. thick, but I once spent a good many hundreds of dollars of my own and other people's money in trying to find a way to machine, on a production basis and to 0.0005 in. limit, pieces of iron of those major dimensions but only 0.0625 in. in thickness. I would still be glad to have some one tell me how it can be done.

In the example of planing cited by the article under discussion there are several errors. In the first place there is little to be gained (nothing unless a double-head planer is used) and much to be lost by attempting to hold two strings of work with one set of clamps, for trouble in one string invariably involves trouble in the other and half the work of setting up has gone for nought. Again, there is no resistance to a lifting moment except the vise-like grip of the shoes, and this must be several times greater than would be required if the pressure were properly applied.

Mr. Berna tells us that the blocks used in the T-slots must not be a drive fit therein and gives an excellent reason *why* they should not; but unless they *are* a driving fit, and sufficiently tight to resist the enormous side pressure brought to bear upon them by the toggle action of the clamps, they will tilt, and the vertical face will no longer be vertical, a condition that at once militates against security of hold and accuracy of results.

Cold Rolled Steel Better for Spacers Than Pieces of Old Files

I can see absolutely no reason for making the pieces which Mr. Berna calls "spacers" (marked *C* in his illustration on page 219) out of old files. It would be much cheaper to make them out of cold-rolled steel. They would serve the purpose quite as well and do away with the necessity for having old bits of file around a planer, a pernicious practice. There are circumstances under which the file bits have their uses, but these circumstances do not exist here.

The desirability of having the under surface of the gib bowed instead of concaved is entailed by the position of the clamps. If there were three clamps to each piece, or if two clamps only were so spaced as to divide the length into thirds (one-third being the combined lengths outside of each clamp) the necessity would not exist. As for bending a cast-iron gib to make it conform to the requirements, how many machinists that have tried to bend a piece of cast iron of this section will agree with Mr. Berna that it is "easy"? It is no simple matter to bend even a *steel* gib, unless you are disposed to consider a "kink" a bend.

In my opinion the proper way to hold these gibs for planing would be to put a "straightedge" on the planer (using a double-faced straightedge in the central slot if thought advisable to plane two strings at one setting) and interpose between it and the work a suitable number of those peculiarly shaped pieces called "holdfasts" in machinists' parlance. The clamping pressure may be applied by toggles as shown by Mr. Berna, but the pieces he calls spacers *should bear directly upon the work* and not upon a separate shoe. Here, and here only, is the use of the file bits justified, and for an entirely different purpose than when used with a separate shoe. Suitably shaped fingers of hardened steel, used in connection with poppets, would be much better.

I have endeavored to show in my illustration my idea of the way to hold a thin narrow casting, such as Mr. Berna has cited, for accurate planing; and this method applies just as forcibly when thousands of pieces are to be produced as when but a single casting is desired, provided real accuracy is essential. It is, however, beyond the scope of a magazine article to teach the art. It is not the simple process that it seems in the outlining but is one that brings to mind bits of tissue paper, lead or brass hammers, steel fingers, stops, poppets, etc., and constant shifting, clamping and replaning of the work, calling into play all the skill of hand, eye and even ear, of the trained machinist. Such men will understand that I am writing about planing a piece *straight* and *parallel*; not "somewhere near."

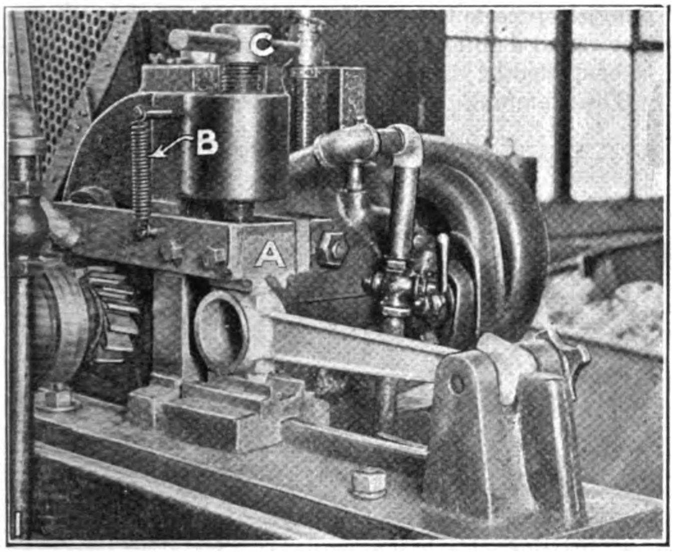
Mack Connecting Rod Methods

Some Unusual Fixtures for Milling and Slitting—A Sequence of Operations that Is Out of the Ordinary—Final Straightening and Inspection

By FRED H. COLVIN
Editor, AMERICAN MACHINIST

THERE are two sizes of motors used in Mack trucks, the smaller having the two-bolt and the larger the four-bolt method of fastening the connecting-rod caps in place. The connecting rod is of sturdy design as befits a heavy-duty motor, and yet is not clumsy in any way. Both types of rod are shown in connection with the machining operations. While utilizing the four-bolt bearing-fastening on the rod for the large motor, the rod is made as light as possible, particularly on the small end where it is desirable to reduce the weight of reciprocating parts to the minimum. The large end, of course, is a rotating member and can be easily balanced.

After annealing and heat-treating, the forgings are given a preliminary straightening, are inspected and sandblasted after which they are snagged to remove the flash left by the forging dies. The machining operations begin with the milling of the crankpin end in the double-spindle Cincinnati machine, shown in Fig. 1. The large end of the rod is held by the bolt bosses by means of the V-blocks shown, the upper block *A* being lifted out of the way by the spring *B* as soon as the clamping screw *C* is released. The small end is clamped between centers which fit into depressions left by the forging dies.



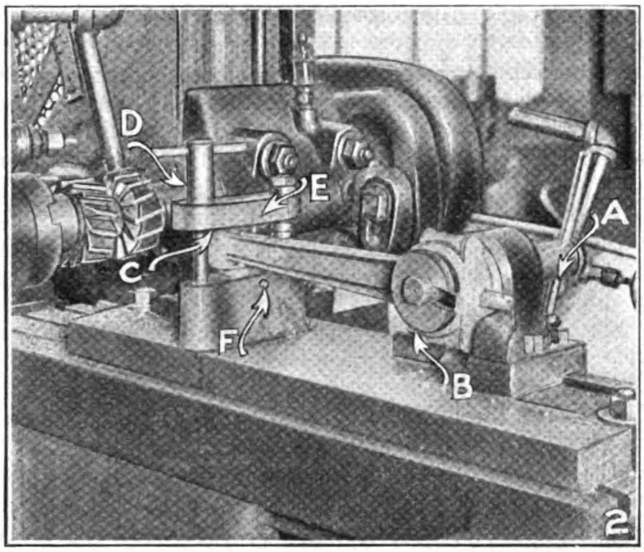
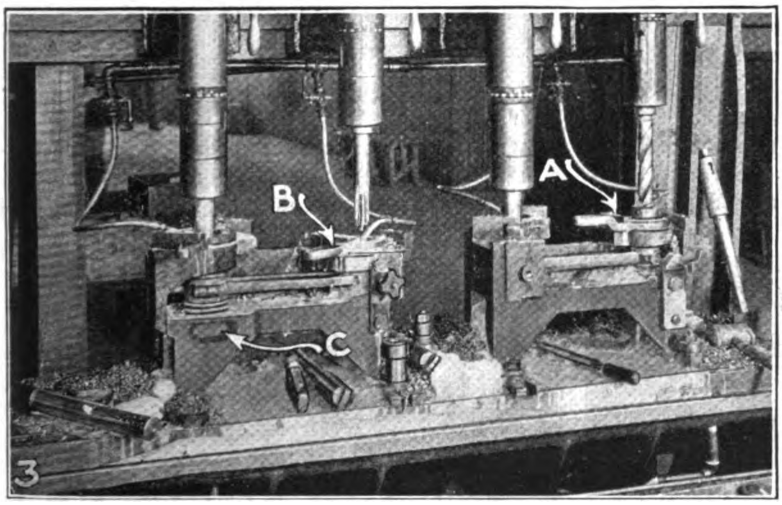


FIG. 1. MILLING SIDES OF LARGE END. FIG. 2. MILLING THE SMALL END



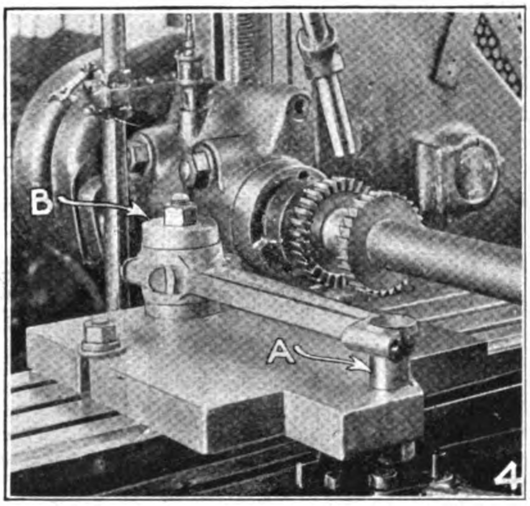


FIG. 3. DRILLING AND REAMING BOLT HOLES. FIG. 4. FACING THE BOLT SEATS

The small end is then milled on a similar machine, as in Fig. 2. The rod is clamped against the milled faces by means of the screw *A* and the open washer *B*. The small end is held by the clamps shown which consist of hardened round-ended pins.. These pins are held in place in the upper and lower clamps, the upper clamp *C* being readily swung out of the way for remov-

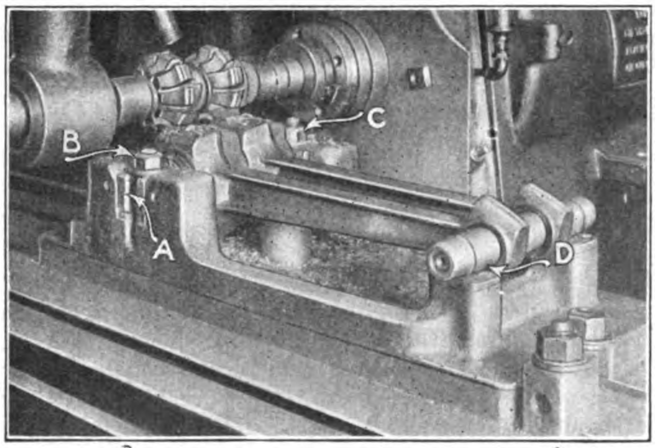


FIG. 5. MILLING BETWEEN BOLT BOSSES

ing and replacing the rod. The clamp screw is at *D*, and *E* and *F* show the pins which act as fulcrums for the floating clamps. The clamps allow the rod to be self-centered without distortion, so that the faces on each end will be milled parallel.

Next comes the drilling and reaming, both operations being shown in Fig. 3. The fixtures are not unusual in design, although the quick-acting bushings shown at *A* and *B* have much to commend them. This illustration shows the way in which the rods are held and also shows very clearly the provision made for the escape of the cutting lubricant by coring a passage as at *C*. This allows the lubricant to flow through the hole being bored and to wash the chips completely out of the way. Both holes are then broached, after which the bolt seats are milled, as shown in Fig. 4. The rod is positioned by the pin *A* which fits the small end, while the clamp *B* holds the large end firmly during the milling cut. The rod is then reversed and the opposite side milled.

In forging the four-bolt rod, the large end is left solid between the bolt bosses, as shown in Figs. 5 and 6. Fig. 5 shows how the rod is lightened by milling the space between bosses and also the way in which it is supported. The rods are milled in pairs, the mandrel *A* fitting both rods and having ends which are squared and slotted for clamping by the bolts *B* and *C*. The mandrel *D*, supports the small ends and holds both rods in line. Fig. 6 shows a rod both before and after milling and also gives a clear idea of the construction of the mandrel *A* by which the large ends are centered and clamped.

The projection on the lower end of the rod, known as the oil scoop, is next drilled, as shown in Fig. 7. The large end of the rod is placed over the stud *A*, while the projecting scoop is centered by jaws *B* and *C*, which are moved by the handle *D*. The drill is guided by the bushing in the plate above. This fixture enables the work to be handled very rapidly.

The bolt holes are next drilled in the fixture shown in Fig. 8, the rod being located on the studs *A* and *B* and held in position by the swinging clamp *C*. This view shows the drilling of one of the two-bolt rods, but the operation on the four-bolt rods is very similar. The radial drilling machine used enables the other holes to be drilled by simply swinging the arm.

The clamping-bolt hole is drilled and tapped in the

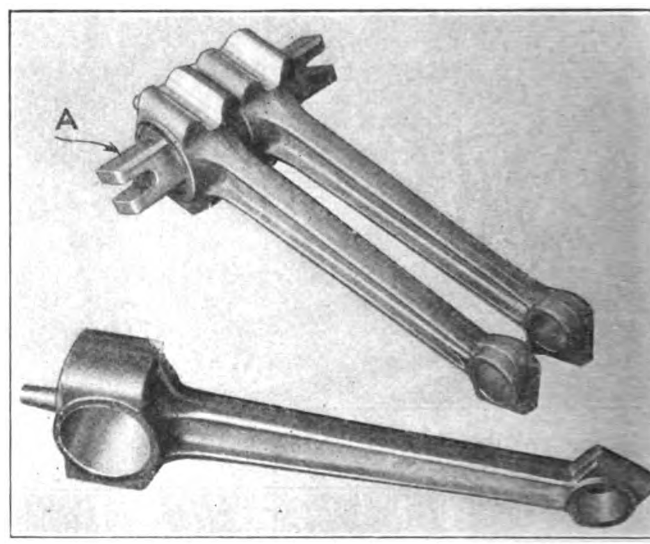
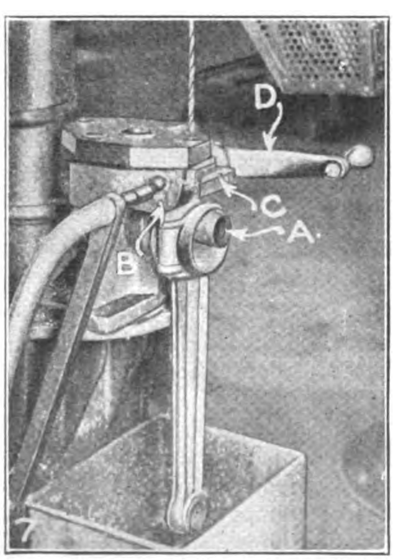
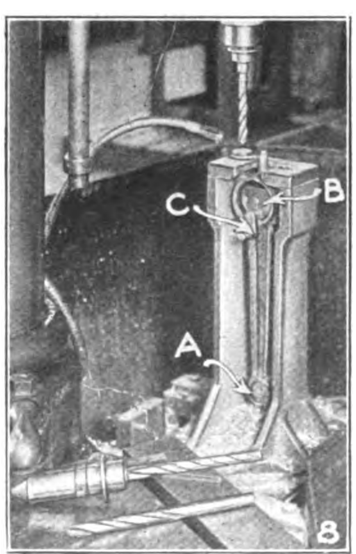


FIG. 6. ROD BEFORE AND AFTER MILLING

fixture shown in Fig. 9, which requires very little explanation. The large end of the rod is over the piece *A* and the small end over the supporting mandrel *B*. The





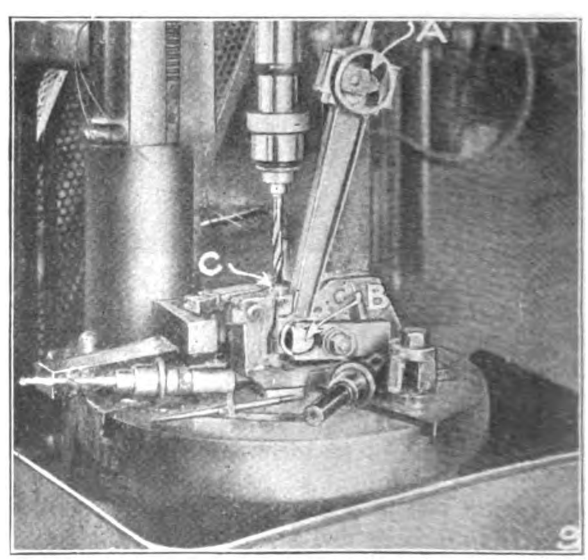
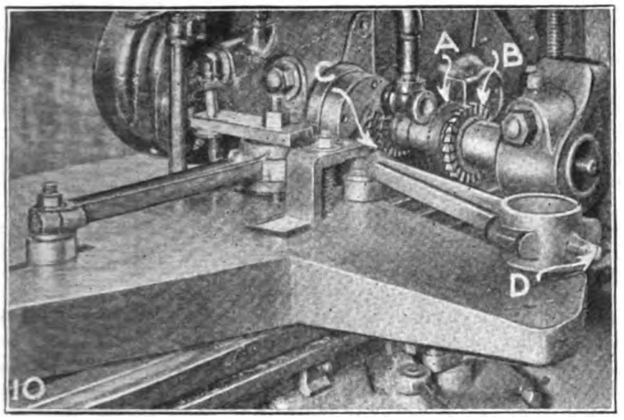


FIG. 7. DRILLING HOLE IN OIL SCOOP. FIG. 8. DRILLING BOLT HOLES. FIG. 9. SLITTING ROD AND MILLING OIL SCOOP



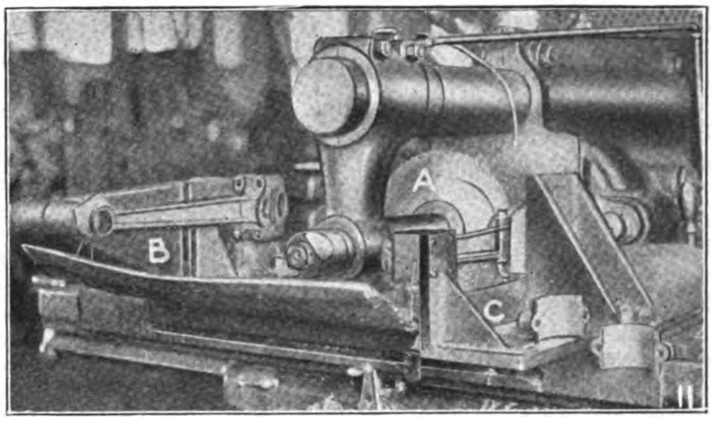
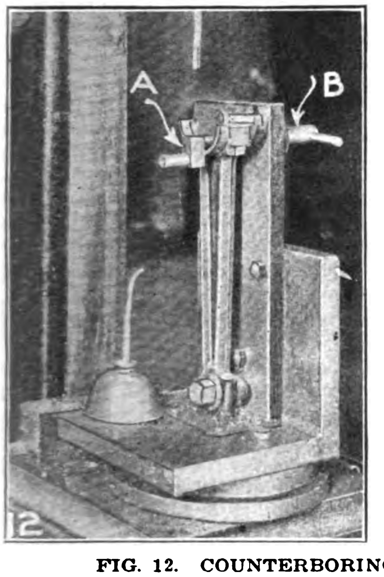


FIG. 10. DRILLING AND TAPPING PINCH HOLE. FIG. 11. MILLING CAPS FROM THE ROD

drill bushing *C* swings out of the way for the tapping operation.

The piston-pin end is slit and the oil scoop milled in a double operation shown in Fig. 10. The slitting saw for the piston-pin end is shown at *A*, while the cutter *B* faces the boss for the clamping bolt. The oil scoop is being milled at *C*, this operation cutting away half of the projection, as can be seen at *D*.



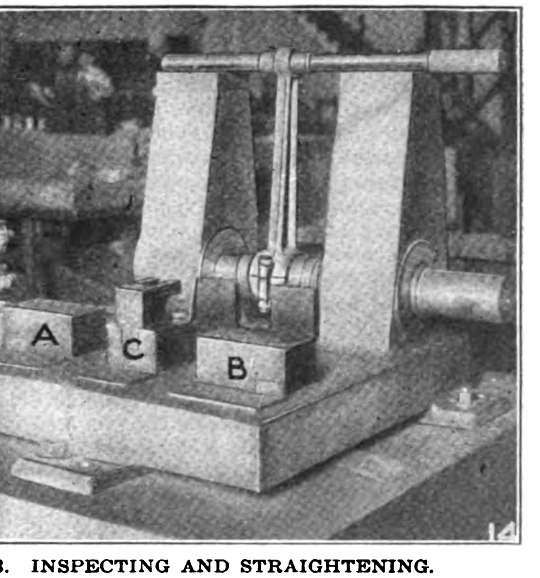


FIG. 12. COUNTERBORING AND REAMING BOLT HOLES. FIG. 13. INSPECTING AND STRAIGHTENING.
FIG. 14. THE FINAL INSPECTION

The sawing of the cap from the rod is shown in Fig. 11, a knee type milling machine with a double fixture being used for this purpose. The slitting saw is shown at *A* and the two holding fixtures at *B* and *C*. One rod can be changed while the other rod is being sawed, so as to make nearly a continuous operation.

The bolt holes are then reamed and countersunk in the fixture shown in Fig. 12. Here the small end of the rod fits over the lower stud while the upper end is held in position around the upper stud and against the shoulder by the swinging clamp *A*, which is drawn back against the rod by the screw *B*. The clamp *A*, when released, can be easily swung up out of the way so as to make removal and replacement of the rods an easy matter. The fixture revolves on its round base to bring the other hole under the cutting tool.

The pinch-bolt hole is then retapped and burred, after which inspection and any necessary straightening takes place, as shown in Figs. 13 and 14. It will be noted that these fixtures are very substantial so as not to be sprung by any straightening which may be necessary. The type of wrench used is shown at *A*.

Fig. 14 shows the testing fixture in more detail, from which it will be noted that the usual steel surfaces test the squareness of the rod in both directions. The test bar in the small end swings down onto the blocks *A* and *B*, and the movable block *C* then locates the small end with relation to its parallelism with the large end. It also shows whether or not the faces of the small end are in correct alignment with the large end.

Standardized Method of Translating Inches to Millimeters

The Sectional Committee of the A. S. M. E. on Plain Limit Gages for General Engineering Work has received a communication from the standardizing body of the Netherlands regarding the translation of inches to millimeters. After careful consideration the commmittee has through its chairman, E. C. Peck, general superintendent, Cleveland Twist Drill Co., prepared the following statement:

It is believed that the necessity for a standardized method of translating inches to millimeters has been brought about by the lack of interchangeability found in many articles of manufacture and commerce. A mere agreed upon method or standard method of translation will be of little value unless it admits of interchangeability in all manufactured product in which the inch dimensions have been translated to millimeters. Interchangeability demands as a fundamental principle that there can under no circumstance be an unintentional interference of metal between mating parts. This means that strict interchangeability does not exist if through any cause (viz: the wear of gages, the inaccuracy of gages, or the translation of inches to millimeters) there is permitted an interference of metal that is not intended.

It seems equally important that the standardized method of translation must meet the requirements of all the arts and industries; that is, the translation must meet the requirements of those doing fine, accurate work as well as those making articles of more common commercial accuracy.

As a matter of fact, the accuracy of this translation is of more importance to the fine work because of its smaller working tolerance. Conversely, it is less vital to those engaged on work of a common commercial kind on account of the larger allowance for fits and the greater manufacturing tolerance.

It should be borne in mind that to avoid interference of metal in mating parts for the purpose of interchangeability, decimal places may be dropped for the dimensions of internal members; but, if the decimal figure dropped is greater than five, the remaining decimal cannot be increased. For external members, the converse of this is true. To illustrate: $\frac{3}{8}$ in. equals 9.525 mm., and for some purposes 9.53 mm. might be satisfactory; but for the internal members of a pair of mating parts in which a good fit is demanded, this 9.53 mm. makes it possible to have this internal member nineteen one-hundred-thousandths of an inch too large to be received by a correct gage. Hence, there is an interference of practically two ten-thousandths of an inch.

Must Suit Present and Future Generations

Any standard method of translation proposed must not only suit the needs of the present generation but those of future generations. Methods of manufacture are being refined each year, and the requirements of machinery as regards accuracy of product are becoming more exacting. Methods of measuring are being improved so rapidly that in gage-making the gage tolerance is spoken of in terms of millionths of an inch, and several manufacturers of gages guarantee their product to be within a tolerance of ten millionths of an inch, or roughly, about one-fourth of a micron.

It must, therefore, be evident that the only method of translation which will suit all cases and work a hardship on none is that which translates in the smallest measurable units that are at the same time workable. This, then carries the translation of inches into microns, and it will be shown that this is not too small for good work and at the same time will not penalize those industries using measurements which do not require great accuracy. When inches and decimals are used, the accuracy desired is obtained by dropping decimal places from the right-hand end; if a translation of inches into metric units and the fraction expressed in microns is used, then the desired accuracy is obtained in the same manner.

It is customary in many shops when a decimal place is dropped and the dimension remaining ends in zero, to call the work correct if it is $\pm$ .5 of the value of the decimal place dropped. To illustrate: $2\frac{1}{4}$ in. (2.250) equals 57.150 mm. and if the zero on the right is dropped, it indicates that no accuracy is required beyond 57.15 mm. A dimension stated this way without tolerance leaves a chance for controversy, as it will rarely be exact. Therefore, it is the practice in some shops to interpret this to mean that if the work is between 57.145 and 57.155 mm., it is correct, because if greater accuracy were desired, it would have been expressed with the tolerance in microns; thus:

$$57.150 \pm {}^{0.000}_{0.002}$$

meaning that it cannot be over but may be two microns under correct size. If the translation of $2\frac{1}{4}$ in. to mm. is carried to tenths of a mm., the dimension would have to be 57.1 or 57.2, and by the usual rule, it would be the latter, and, no doubt, for many purposes would be good enough, but for others entirely unsuitable.

Suppose this $2\frac{1}{4}$ in. dimension was a crank bearing of an automobile engine, the grinding dimensions would probably be 2.2495 in. to 2.2499 in. (good American practice). Then, the use of 57.1 or 57.2 mm. would not be near enough for interchangeability, as 57.1 mm. equals 2.24802 in., and 57.2 mm. equals 2.25196 in. If we carry out the translation to the nearest 0.01 mm., the dimension becomes 57.15, and with no tolerance expressed, we would, as figured above, use 57.145 mm. equals 2.2498 in. and 57.155 mm. equals 2.2502 in.; and for this work a juggling of tolerances might make it acceptable.

Gage Work

For gage work, however, all translations ought to be carried out to microns, as this is not too fine for this work. A micron is 0.00003937 in. or practically 39-millionths of an inch and the choice of which micron a measurement is intended to be leaves the value of the possible discrepancy as about 20-millionths of an inch, which is greater than the tolerance some gages are made to. It must, therefore, be evident that the metric system does not contain a unit small enough for the finest work now being done in this country, and it is prophesied that for some purposes the micron will be sub-divided into tenths.

We propose this method of translating inches into the metric system. Adopt the value of the American inch, 25.4 mm. as the basis of all translations of length, and my reasons are as follows:

(1) The error cannot equal one micron until 10 in. is reached and is only one micron for each 10 in. of length.

(2) It is fine enough for any work.

(3) If 25.4 mm. (carried only to tenths mm.) is used, as it will be for many purposes, the error is only one-tenth of a micron or practically four-millionths of an inch, a quantity so small as to permit of interchangeability for all industrial and commercial purposes.

(4) It allows the translation to be made by the simple multiplication of 25.4 by the inches or decimal fractions thereof. (Many divide the inches and fractions by 0.03937 to get mm.).

(5) For precision work, the computation may be carried out to the extreme decimal part of a mm. and used without changing the value of the inch as used in America.

(6) If tables are compiled on this basis, the accuracy desired will be determined by the user who will drop as many decimal places as suits his particular purpose.

Exhibition at Gothenburg

The Aeronautical Chamber of Commerce of America has received the program for the international aero exhibition which is to be held at Gothenburg from May 15 to Sept 10, 1923. This exhibition will be held in conjunction with the 300th anniversary of the foundation of the city of Gothenburg. The aeronautical part of the program will take place from July 20 to Aug. 12. It will be under the direction of the Royal Swedish Aero Club.

Further information about this exhibition can be had from the Aeronautical Chamber of Commerce of America.

Machine Tool Shops According to the 1919 Census

Analysis of the Figures Published in the Last Census of Manufacturers Show Interesting Economic Facts—Larger Shops Much More Efficient

IT IS quite likely that few business men realize the fund of information contained in our national census compilations. The documentary mass is usually so imposing that only an ardent seeker after facts has the perseverance to dig into it and come out with something valuable.

From the accompanying table, however, some interesting deductions can be drawn. The shops of the country making machine tools have been classified in four groups according to the dollar value of their product. The number of shops in each class is listed in the second column and the total value of their product in the third. The cost of the materials used is placed in the fourth column and the fifth column is obtained by substracting 4 from 3.

It should be noted that Class 2, over $500,000, means over $500,000 and below $1,000,000. Summations are made below the first set of figures and show, among other things, that the total turnover of capital for the year is slightly less than one, $\frac{212,400,000}{231,000,000} \doteq 0.917$, to be exact.

The fact that 80 per cent of the product, measured in dollars, is made by 93 of the 403 shops and that 95 per cent is made by 277 is also worth noting. Taking only the shops with an output of over $1,000,000 we find that 13 per cent of the shops turn out 69 per cent of the total output.

If we now take into consideration the number of wage earners employed in each class of shop, we discover that the bigger the shop the larger the value of the product per wage earner employer. The same applies to the added value per wage earner.

Reducing some of these figures to a percentage basis it becomes evident that 13 per cent of the shops, the big ones, produced 69 per cent of the value of product and employed 66 per cent of the wage earners. On the other end of the scale 44 per cent of the shops, the little ones, produced but 3 per cent of the value of product and employed but 5 per cent of the workers.

The struggle for existence which confronts the small shop is indicated by the fact that even in a good year like 1919, it produced 25 per cent less per wage earner employed than the average of all shops.

Machine Tools—1919 Census

INVESTED CAPITAL $231,000,000.00

Class by Value	Number of Shops	Value of Product	Material Cost	Value Added by Manufacturers	Number of Wage Earners	Product per Wage Earner
1—Over $1,000,000	52	$146,142,000	$38,636,000	$107,506,000	35,525	$4,100
2—Over 500,000	41	27,856,000	7,847,000	20,009,000	7,235	3,869
3—Over 100,000	134	31,760,000	10,271,000	21,849,000	8,162	3,873
4—Under 100,000	176	6,642,000	2,280,000	4,362,000	2,186	3,030
Total all classes	403	212,400,000	59,034,000	....	53,111	4,000
80 per cent—Class 1 and 2	93	173,988,000	46,483,000	....	42,763	4,050
95 per cent—Class 1, 2 and 3	227	205,758,000	56,754,000	....	50,925	4,032

Class	Added Value per Wage Earner	Ratio Added Value to Product	Ratio Material to Product	Material per Wage Earner	Per Cent of Shops	Per Cent of Value	Per Cent of Wage Earners	Wage Earners per Shop	Product per per Shop
1—	$3,029	74	26	1,071	13	69	66	683	$2,810,000
2—	2,766	71	29	1,103	10	13	14	176	679,000
3—	2,634	66	34	1,239	33	15	15	62	238,000
4—	1,946	67	33	1,084	44	3	5	12	38,000
Total	2,887	72	28	1,113	100	100	100	132	531,000
80 per cent	2,979	73	27	1,071	23	82	80	461	1,870,000
95 per cent	2,927	72	28	1,105	56	97	95	224	906,000

To Examine Ordnance Designs

L. W. Wallace executive secretary of the Federated American Engineering Societies, is in receipt of the following letter from Brigadier General W. S. Peirce, Assistant Chief of Ordnance of the Army:

"In reply to your recent letter referring to the matter of examination by the engineering societies of ordnance designs and especially in regard to the economy and facility of production in quantity, I take pleasure in informing you that, pursuant to your reference of the matter to the American Society of Mechanical Engineers, that society submitted the question to letter ballot by its ordnance division, and that ballot being in favor of the resolution, the same was adopted by the council of the A. S. M. E.

"Pursuant to this action by the A. S. M. E., it has been decided that the best plan of procedure will be for the Ordnance Department to submit drawings showing proposed designs, which the executive committee of the ordnance division, A. S. M. E., will refer to certain specially qualified members for criticism. Undoubtedly there will be further details of procedure to be determined from time to time, but it has been thought best to leave the matter until several particular cases have been handled."

Unique Power Plant in a Small Shop

By Ellsworth Sheldon

While prospecting around in Northern New England the other day the writer chanced upon a small garage and machine repair shop in which there was a power

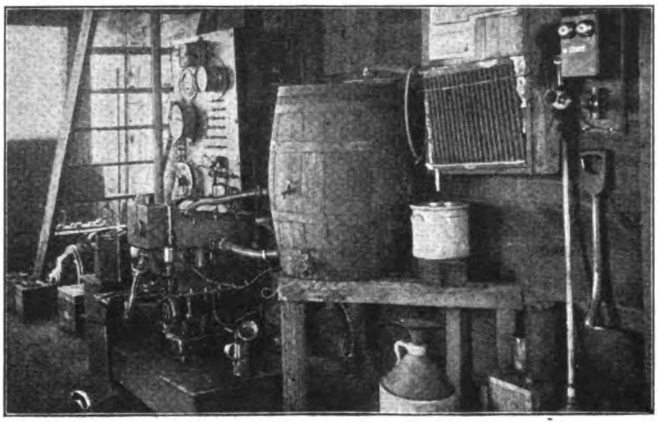


FIG. 1. THE COMPLETE POWER PLANT

plant that displayed some novel, not to say unique, features.

The main unit in its original form has no particular claim to distinction. It was manufactured by the Ford Motor Co., of Detroit, and until the present owner lifted its mangled remains from a local automobile wreck, was exactly like thousands of its contemporaries that are still doing business in the ubiquitous Fords. But I doubt if in its present shape any of Ford's engineers would recognize it.

The complete plant, shown in Fig. 1, comprises a Ford engine so changed as to adapt it to kerosene instead of gasolene fuel; a 110-v. direct-current Bullock generator; a 56-cell chloride accumulator, and a device for producing distilled water as a by-product.

The accumulator cells are located in a large, well ventilated closet behind the switchboard and are not, of course, evident to the casual observer. The jars are of glass, of ample proportions to hold the plates without the necessity for wooden separators, and are neatly

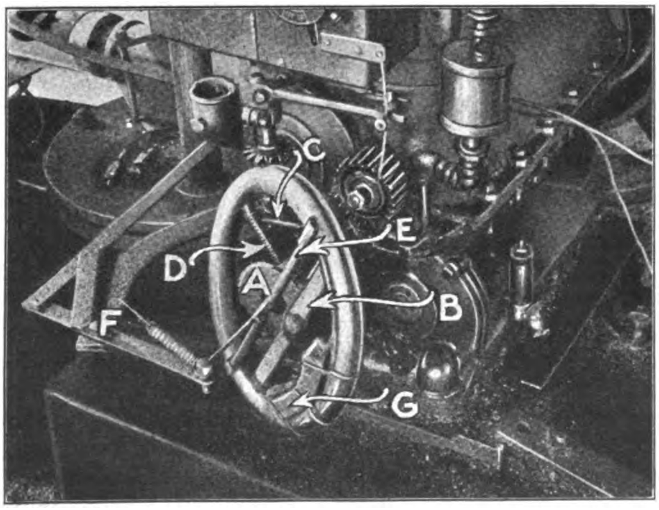


FIG. 2. THE GOVERNOR OF THE ENGINE

arranged in groups on several shelves so that any one cell may be removed for cleaning and another one substituted without disarranging the battery or interrupting the current except for the moment required to make the connections.

The plant is entirely self-contained. Despite the integrating wattmeter to be seen at the top of the switchboard, the proprietor neither buys nor sells current, all "juice" being made and consumed on the premises.

When I first saw the shop the power was not running but as I immediately evinced interest in it, the proprietor volunteered to "start 'er up." Casting an anxious look about the floor, he called to one of his men: "Frank, where is the crank we start this engine with?" "Dunno," responded Frank, "las' time I seen it it was down cellar behind the piano." As Frank spoke the engine started, and before I could turn to see how the thing was done, was in full operation.

The proprietor, hugely enjoying my puzzled discomfiture, allowed me to hunt for several moments to find the starter before he opened the closet door and showed me the storage battery. Not until then did I realize that it was the generator, running as a motor upon the accumulator current, that was doing the work. Opening the throttle and turning down a two-throw switch on

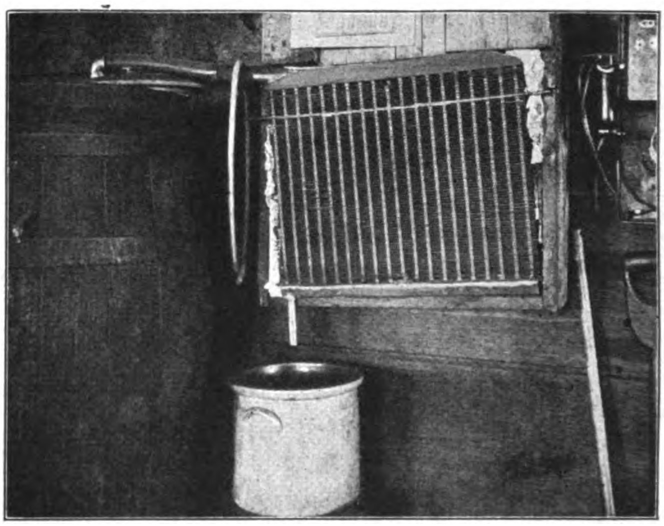


FIG. 3. THE "DISTILLERY"

the board, the engine took over the job without hesitation and everything was in full blast.

The only physical change in the engine necessary to adapt it to its new fuel was to increase the combustion space and readjust the carburetor. The former was done by removing the head and introducing between it and the cylinder block a flat plate of cast iron about $1\frac{1}{2}$ in. thick, bored to correspond to the cylinders and using two gaskets instead of one to remake the joint. The engine runs equally well with either gasoline or kerosene but, of course, loses some of its original "pep."

To maintain a constant speed for shop power purposes some kind of automatic governor was necessary and this, perhaps the most simple and ingenious device of the whole outfit, is shown in Fig. 2. A flanged bushing *A* is keyed and setscrewed to the protruding end of the crankshaft and bolted firmly to the flanged end is the bar B, made of two pieces of square cold-rolled stock and journaled at the ends to take the ring which acts as the governor weight.

The ring is the balance wheel of an old sewing machine. The spokes have been cut out and two holes drilled in the inner side of the rim into which the journals of the bar *B* are fitted. The rim revolves with the

engine shaft in a true circle but is free to swing out of a true plane, thereby becoming an ellipse. The tendency of the revolving rim is, of course, to swing into a true plane by virtue of the action of centrifugal force.

This action is resisted by the coil spring *C*, attached at one end to the inner end of the flanged bushing while the other is hooked over the notched post *D* that is driven into the rim. By moving the spring to or from the center of rotation along the line of notches the effective pull is diminished or increased; thereby adjusting the engine to any desired speed within its range.

A smaller crossbar *E*, bolted to the rim, carries an extension at right-angles which connects through the system of levers at *F* with the throttle. The piece *G* is a lead weight added after the device was complete, to bring it into balance.

The cooling system and water distilling apparatus consists of an old oil barrel, some pieces of hose, and the radiator of the Ford, all of which may be seen to better advantage in Fig. 3. The radiator is built into an opening in a wooden stack which extends through the roof of the shop and thus there is a natural draft of air passing through the radiator cells at all times.

After the engine has been running for a short time the water in the barrel becomes hot enough to throw off a vapor, and this vapor in passing through the radiator becomes condensed, the condensation dripping into the stone jar below. The distillery does not work very fast but its works all the time, without expense or supervision. There is always a supply of distilled water in the jar.

The accumulator will drive the shop for an hour if need be, but its real service, besides starting the engine, is to furnish current for lighting the shop and the proprietor's residence, adjoining, at times when the engine is not running. Standard 110-v. bulbs are used and the cost is nothing but a little extra kerosene and the very small amount of attention required by the accumulator. Direct current is also available at all times for recharging the small storage batteries of automobiles, which is a part of the proprietor's business.

When I expressed surprise at the presence of the wattmeter with no bills either payable or receivable to account for, he said: "Oh! I just picked it up somewhere and installed it to keep tabs on the engine. If she don't tread up the meter according to my figures I know she ain't earning her kerosene and I just start an investigation."

Erratum

Too late to make the changes on the original plate, we received from G. E. Katzenmeyer the accompanying chart which is a revision of Fig. 2 in the article "Strength and Proportion of Industrial Gears," on page 666 of our issue of May 4. Those readers who clipped the original article for reference should see that this chart replaces the incorrect one.

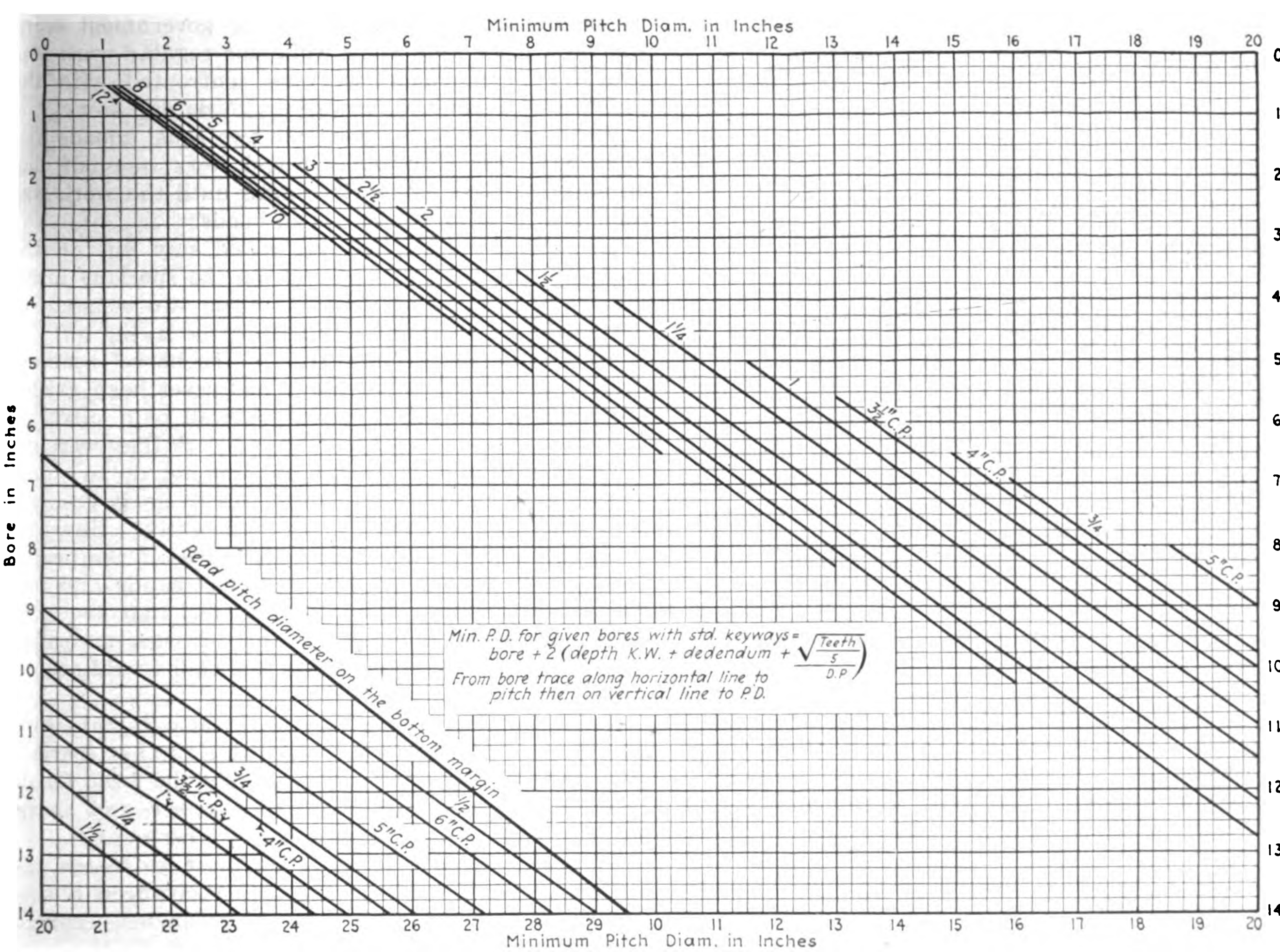


CHART FOR MINIMUM PITCH DIAMETER

Amortization of Plant Facilities*

Pursuant to Art. 184 of Regulations 62, the Commissioner of Internal Revenue has determined and publishes the following ratios of estimated post-war cost of replacement for use by taxpayers in computing claims for tentative allowance for amortization.

The purpose of establishing these ratios is to facilitate the preparation and examination of claims and to bring about, to such extent as may be practicable, uniformity as to the basis of claims. The allowances based thereon will be purely tentative and subject to redetermination in accordance with the provisions of the law.

These ratios, condensed as they are to cover sixteen groups, are necessarily composite figures, arrived at by an examination of many items entering into the respective groups, and it is realized that in some cases where only a limited number of items in the group are involved, the ratios given may not fairly be applicable to a particular case. In such cases the claim for amortization should be made in accordance with the ratios published, but the taxpayer, along with his claim, should submit a statement showing in detail the reasons why, and the extent to which, such ratio is not properly applicable to his claim, so that such cases may receive special consideration; in like manner, there may be cases where the ratios as applied to the particular claim would give the taxpayer more than a reasonable allowance, and in such cases the ratio properly applicable will be determined on the examination of the claim and the taxpayer given notice thereof.

All ratios are expressed in percentages based on prices as of June 30, 1916.

	Per Cent
A. Ratios for computing estimated post-war cost of replacement of buildings, vessels, cars, tanks, blast furnaces, open hearth furnaces, annealing furnaces, electric furnaces, coke ovens, and construction of all kinds.	
1. Lumber:	
(a) Hard	240
(b) Soft	175
2. Structural steel	60
3. Building materials, other than lumber and structural steel	225
4. Steel (other than structural steel) and steel products	90
5. Building equipment	150
6. Labor (all classes)	160
B. Ratios for computing estimated post-war costs of replacement of machinery and equipment.	
7. Electrical machinery and equipment	130
8. Engines, turbines, compressors, and similar facilities.	175
9. Pumps	135
10. Boilers	160
11. Transmission equipment:	
(a) Shafting, pulley, hangars, etc	135
(b) Belting	100
12. Machine tools and small tools (machine tools are considered as that class of metal working machinery which can be used on *both* cast iron and steel)	130
13. Wood-working machinery	155
14. Textile machinery	155
15. All other machinery (including cranes):	
(a) Machinery, the cost of which did not exceed 10 cents per pound as of June 30, 1916	120
(b) Machinery, the cost of which did exceed 10 cents per pound as of June 30, 1916	130
16. Office furniture and equipment	125

*For further information in regard to Regulations 62, see AMERICAN MACHINIST, issue of March 30, 1922, page 482.

Standardization in Hardware

The following paragraphs are from a letter sent to the Chamber of Commerce of the United States by a prominent hardware manufacturer. It can be seen what advantages may result from the elimination of unpopular products. The example set by this manufacturer might well be followed by many makers of small products such as hand tools.

"We have generally considered ourselves as originating the movement for the elimination of unnecessary patterns, sizes and finishes, especially in the hardware field. We started this work ten years ago.

"We have cut our line of hammers, hatchets, axes, files and sledges down from 2,752 items to 761 items. We have done even more than this. We have concentrated nearly 90 per cent of our business into 344 of those 761 items. We have gone further along this line than has any of our competitors. Our whole industry responded willingly to the request first made upon them by the Hardware Manufacturers' Organization for War Service and followed up by the Conservation Division of the War Industries Board, but the industry as a whole has not gone as far as we have individually.

"Since the war some members of our industry have restored part of the items they dropped, but not many. We do not consider this any disadvantage to us. If they want to take action which we consider economically unsound, we feel that it puts them at a disadvantage in competing with us. It helps us to reduce our costs lower than theirs. It gives us a selling argument. It increases the strength of our selling argument to our distributors—that there is no dead wood in our line."

Handling Men

BY F. W. REARDON

During the late war the writer was in charge of straightening gun and rifle barrels in a gun shop engaged in the production of sporting arms. A contract was taken for rifles for the Government, and at the time we had a lot of unfinished sporting arms in the shop. It was thought advisable to finish this work up as rapidly as possible, but as the government work was on a piece work basis while our regular work was paid for by the hour, we were confronted with the problem of getting piece workers to do day work.

Finally I divided the men into two equal squads and told them that each squad would work one-half day on alternate days on sporting arms until the work was completed, making it fair for all hands.

Once in a while some man would stay out on the half day his squad was to work on the sporting arms, but when he came in I made him do two consecutive half day's work on them. This cured the laying off.

Later on I was given charge of the barrel reaming department where the operators had never been graded according to their ability, but were all paid alike regardless of their skill or the class of work they were on.

The quality of work turned out was not up to standard and no one apparently knew how to do it properly or seemed able to learn. I said apparently. However, I felt sure that matters could be improved if the proper inducements were given, so I called all hands and told them I was going to make a change and that the work was going to be divided into four classes, according to quality, and that their ability and skill would control their pay.

Rough-reaming was to be paid for at a certain rate. Second reaming 5 per cent more with a further increase of 5 per cent for finish-reaming; and the best finish-reamers were to be picked as tool setters and sharpeners with a still further increase of 5 per cent.

Soon each man was doing his best to reach the highest grade of work and pay and I advanced him as fast as his skill would warrant and vacancies occurred. New men were put on rough-reaming. Soon the work was up to standard and all hands were satisfied.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Turning Special Tapers

By Wilmer H. Bath

It is sometimes necessary to turn special tapers on the lathe, i.e., tapers of such angles and length that it becomes impossible to turn them with the use of the taper attachment or the compound rest.

This was the case recently in the shop with which the writer is connected. The angle in question was 19 deg. 20 min. included, and nearly 10 in. long. This angle we could not get with the taper attachment which has provision for a maximum angle of 15 deg., included and the travel of the compound rest was so small that it would have been necessary to reset the tool several times during the cut.

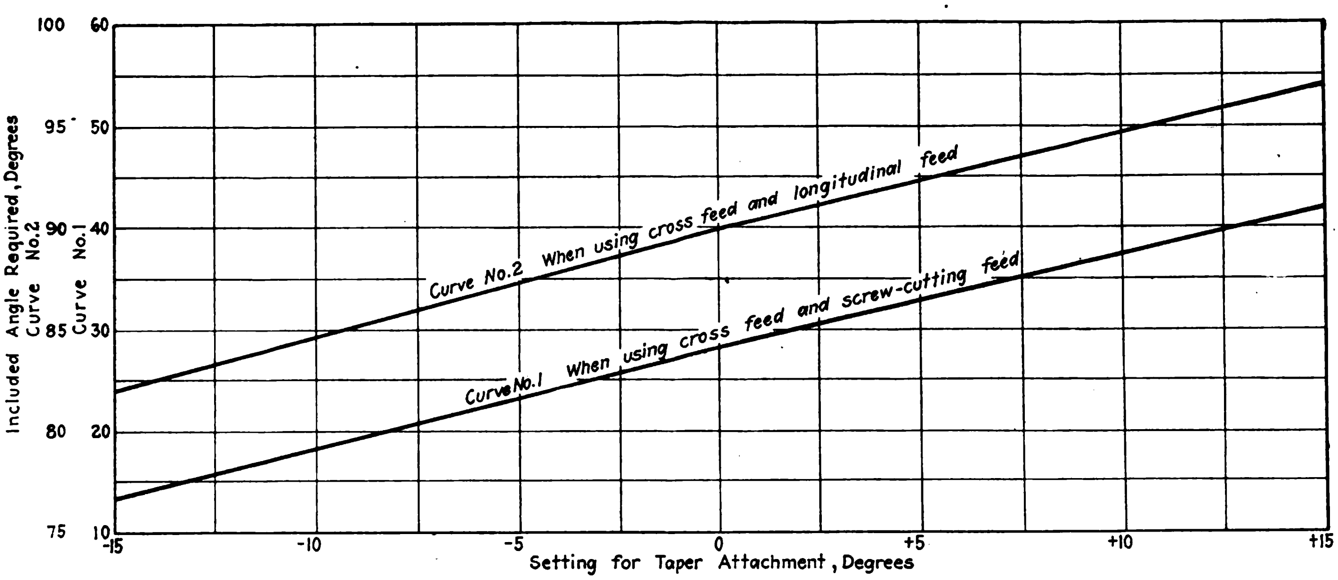
With these handicaps in mind we began to look around for a quicker method. The idea of any special apparatus was not acceptable as the time consumed in making it would have been greater than that required to do the job, since there was but one piece to be made.

We investigated the conditions on a 16-in. Hendey lathe to try and determine an easy set-up for the job. During this investigation it was discovered that it is possible to turn tapers on the lathe mentioned as noted by the accompanying curves.

By using the taper attachment alone we have found it possible to turn tapers up to and including 15 deg., and by using the longitudinal feed in combination with the crossfeed to turn a taper of 90 deg. included. By using the screw-cutting feed in combination with the crossfeed a taper of 28 deg. 4 min. 12 sec. included could be turned.

The endeavor, then, was to combine one of these set-ups for apron power feed, with the taper attachment, in other words, to vary the angles 28 deg. 4 min. 12 sec. or 90 deg., by an amount equal to that indicated by the setting of the taper attachment.

The action we get when using a combination of feeds, as mentioned, is that the taper attachment causes the crossfeed nut to move through a distance equal to the tangent of the angle to which it is set while the crosspower feed operates the crossfeed screw. Operation of either the nut or the screw causes the motion of the toolpost. In addition to this combined movement there is motion due to the longitudinal feed or the screw-cutting feed. The screw-cutting feed operates the carriage at a speed four times that due to the longitudinal feed.



CURVES OF TAPERS THAT CAN BE TURNED BY USING CROSS AND LONGITUDINAL FEEDS IN CONJUNCTION WITH TAPER ATTACHMENT

A word of explanation as to the derivation of the angles 90 deg. and 28 deg. 4 min. 12 sec. Since the ratio of the longitudinal feed to crossfeed is 1:1, we have two equal values representing the adjacent side and the opposite side of a right-angle triangle. This gives a tangent of 1, or an angle of 45 deg. Doubling this, we get 90 deg. included.

Similarly, since the ratio of screw-cutting feed to crossfeed is 4:1, we again have the two sides of a triangle and taking the tangent of the angle we get 0.250 or the tangent of 14 deg. 2 min. 6 sec. Doubling this gives 28 deg. 4 min. 12 sec. included.

If the screw-cutting and crossfeeds are used and the taper attachment set to 15 deg. included, it would seem as though the angle would be 43 deg. 4 min. 12 sec. included. This, however, is not the case as the cross motion would be the sum of the tangents of the two angles, 7 deg. 30 min. and 14 deg. 2 min. 6 sec., or 0.38165 which is the tangent of 20 deg. 53 min. 21 sec. This, doubled, gives an included angle of 41 deg. 46 min.

42 sec. This, no doubt, will explain the origin of the curves shown. Taper attachment settings are noted as plus or minus. Plus indicates motion toward the operator and the lathe spindle, and minus indicates away from the operator and toward the lathe spindle.

Since any combination of feeds through the apron gives motion of the tool toward the operator when the carriage is moving toward the spindle, or away from the operator when the carriage is moving toward the tailstock, it will be observed that it was necessary to use a negative setting of the taper attachment as the work had to be held by the small end for boring.

A feature of the boring job was that we reversed the direction of the lathe spindle and used a tool forged left-hand, or opposite to a regular boring tool, the cut being taken on the back side of the bore.

Tools for Trimming Electric Push-Button Switch Plates

By George Wilder

In Fig. 1 are shown five sizes of electric push-button switch plates, namely two, three, four, five and six gang. After the blanking and stamping the next operation is trimming to remove the flash left by the stamping tools. The operation for producing similar plates with only one pair of holes has been explained in a previous article so this description will be confined to the trimming tools.

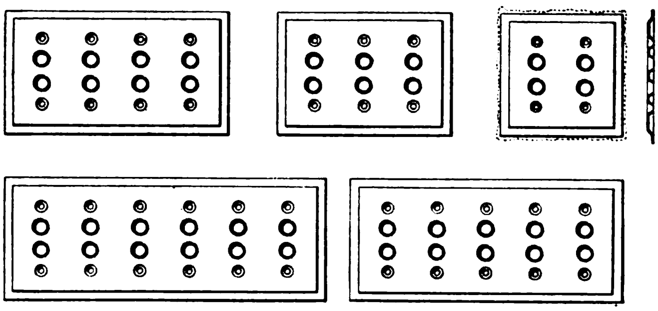


FIG. 1. SWITCH PLATES TO BE TRIMMED

Because of the very thin metal it would not be good practice to try to push the plates through a die, as this procedure would cause the metal to buckle and leave small kinks that would be next to impossible to remove and often invisible until after the plates are buffed. Also if a clipping die were made for each size it would necessitate five sets, and the cost would be very high.

As orders for the large sizes of plates call for comparatively small quantities, the large tools would hardly be a paying proposition, therefore a set of tools, simple in design, was built to clip all sizes of plates at a total cost of little, if any, more than the cost of one big set.

One objection offered to this method of handling all sizes with one set of tools was that each plate would have to be handled twice, as only two sides could be clipped at once, but it was shown that even with this handicap it would take over five million plates (clipped four sides at once) to pay for the five sets of tools and their upkeep. Therefore the set shown in Fig. 2 was built and operated successfully at a cost one-third under the estimate.

The operation of this set of tools is as follows: The plate is placed on the die, being located by the stamped contour fitting over the corresponding nest, and as the press descends the blade *A* clips the front side while the blade *B* clips the right-hand end. The piece is then reversed to clip the remaining sides.

In the punch holder is a pad *C* backed by the springs *D*, which holds the work firmly in the die while the blades are cutting. The blades are ground to an angle to give a shearing cut.

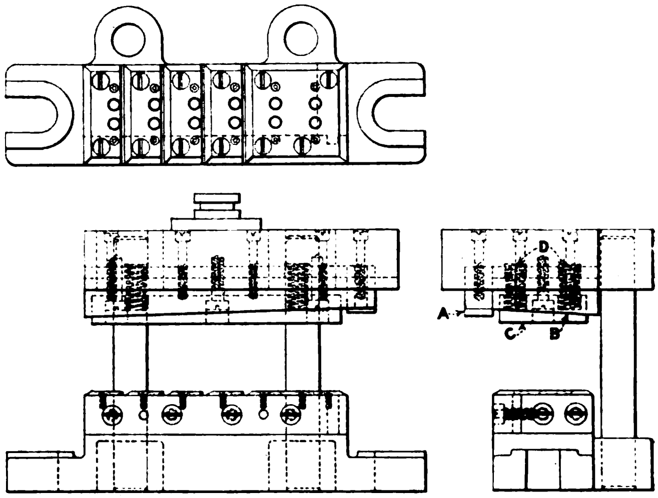


FIG. 2. THE TRIMMING TOOLS

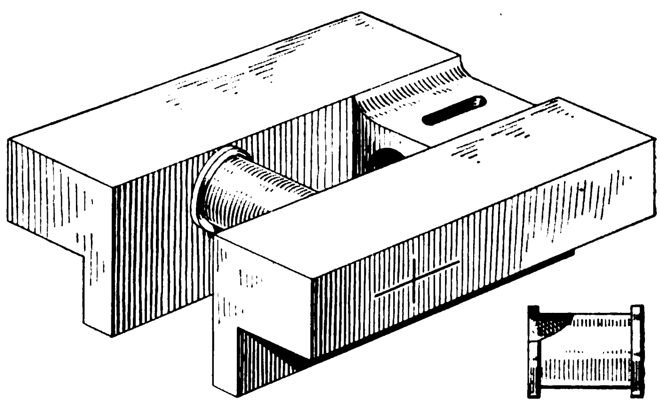
The tools were of the pillar types and with them the operator was able to clip about five thousand pieces per day, irrespective of the size of the piece. A Farrell press, equipped with safety devices to prevent the operator from getting caught, was used.

Chilling a Crosshead Wristpin

By F. M. A'Hearn

In the average repair shop where there are seldom to be found special devices for the purpose, the turning of a wristpin in a crosshead of the type shown in the illustration is a tedious operation and involves a lot of hard labor for the man who has to rock the work back and forth while the lathe hand, with the usual array of bent tools and goosenecks, endeavors to round up the pin and face the shoulders.

Such a crosshead was needed for a 17 x 24-in. locomotive and, as is usually the case, the engine was being held out of service until a casting could be made and machined. To reduce the time and labor required we decided to try casting the pin in a chill.



CROSSHEAD WITH A CHILLED WRISTPIN

The gray-iron bushing shown at the right of the sketch was made to the required dimensions as to length and bore, leaving a wall of about $\frac{3}{16}$ in. It was

then thoroughly coated with graphite to prevent the molten metal from adhering, and placed in the mold. When the casting had cooled, the shell of the bushing was easily broken away and we found the bearing parts to be in satisfactory condition.

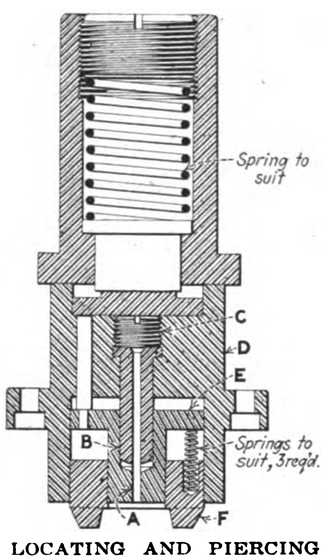
To lay out the casting for finishing so that the pin would be square with the planed surfaces we placed the pin in a V-block with the crosshead in a horizontal position and scribed the lines as indicated upon the outer surface. Raising the crosshead to a vertical position the cross lines were laid out and centers established, from which we were able to plane and finish the casting with the pin in proper relation to the guides.

The job proved to be satisfactory in every way and the labor of finishing the pin was saved, thus reducing by that amount the time that the locomotive was out of service.

Tool for Locating Watch Wheels for Piercing Center Hole

By I. Bernard Black

In the manufacture of watches there are many operations, especially the blanking and piercing of the escape, center, third and fourth wheels, which may cause a lot of trouble in the time keeping. Sometimes this is due to the wheels being blanked out of round, or to the holes being pierced at one side, the latter cause being most often the case. When the holes in the wheels are not central, a lot of friction is developed in the train and the watch naturally stops. The wheels causing this trouble have to be replaced, of course, with wheels that are absolutely perfect as regards concentricity. In many cases ingenious methods have been devised to correct this fault and most of them have proved successful.



LOCATING AND PIERCING TOOL FOR WATCH WHEELS

In the illustration is shown a method adopted recently for accurately locating watch wheels to be pierced. Part *A* is the piercing punch, which is lightly driven in the holder part *B*, the upper part being riveted over and backed up by the setscrew *C*. The holder part *B* is a drive fit in the main holder part *D*, and a sliding fit in part *E*, which in turn is a sliding fit in parts *D* and *F*. Part *F* is a sliding fit in part *D*, and is attached or rather held to part *D* by two screws. The action of the holder is as follows:

When the ram descends, the bell-mouthed piece *F* centers the wheel in the die, and recedes into part *D* until part *E* presses down on the wheel in the die, thus firmly clamping it while the piercing operation is done by part *A*. On the upward stroke of the press parts *E* and *F* spring back to their relative positions, the operator takes the pierced wheel off the die and is then ready to pierce another. Centralization of the hole is thus secured, and with a die that will punch a truly round wheel, very accurate work is produced.

Making Long Screws

By R. G. Hogg

On page 132 of American Machinist, L. J. Grinnell outlines some very elaborate methods of making and transporting two guide screws 64 ft. and 74 ft. long, respectively.

The factory situated next door to the one where I served my time, and later where I served two years, had a regular habit of making such screws 64 ft. and 68 ft. long every few days.

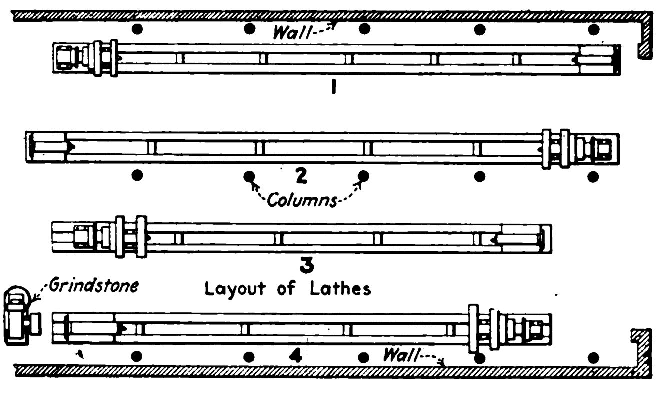


FIG. 1. ARRANGEMENT OF THE LATHES

First the turner would select a bar of steel, drag it over the cobbles by divers means, center it with the aid of about three helpers and juggle it into position between the lathe centers. After the thread was cut, came the puzzle how to reverse ends in the lathe to finish a thrust bearing on the other end. The shop was about 75 ft. long and 30 ft. wide and freely dotted with columns to support the second story which contained about 40 small lathes. The ground floor contained four large and long lathes and one pre-historic grindstone, the arrangement of the tools being shown in Fig. 1.

Now I am wondering how the Driggs Co. turned the screws end for end. The enclosed crude diagrams will explain how we turned them. The short ones were transferred from No. 1 lathe to No. 2. The extra long ones were machined on lathe No. 2 (the longest in the shop) and had to be jockeyed on two or three small four-wheel trucks around the block to be turned and then brought back to the lathe. The route taken can be seen in Fig. 2.

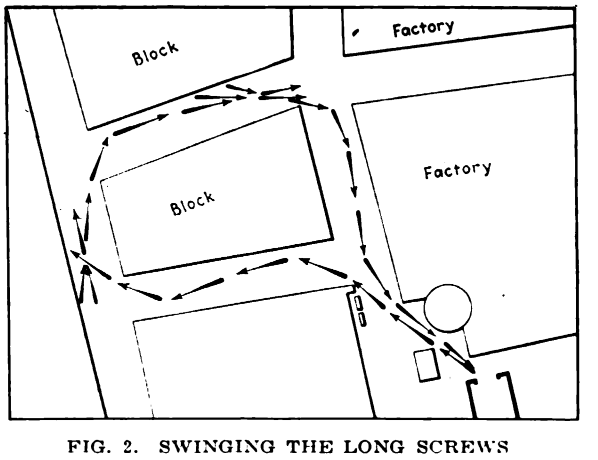


FIG. 2. SWINGING THE LONG SCREWS AROUND THE BLOCK

William, or "Old Bill," who is not yet sixty has

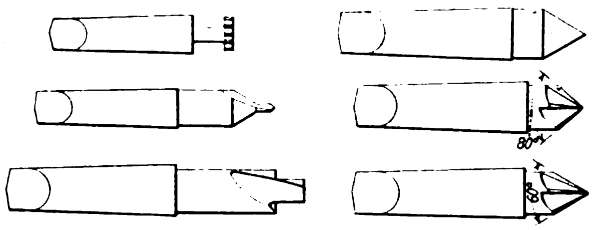
been making these screws for over twenty-eight years and as for transportation troubles, after he was through with his part he didn't give a whoop, but we never had any complaints to my knowledge.

The device was used in a shaper with the apron clamped down, as the cut comes on the back stroke. The tool came forward, the screw was given a slight turn, which forced the cutter out at each stroke.

Uses for Discarded Taper Shank Drills

By Frank C. Beere

Taper shank drills that have been worn out or broken in service, but of which the shank is still undamaged, may be used up in several ways as shown in the sketch



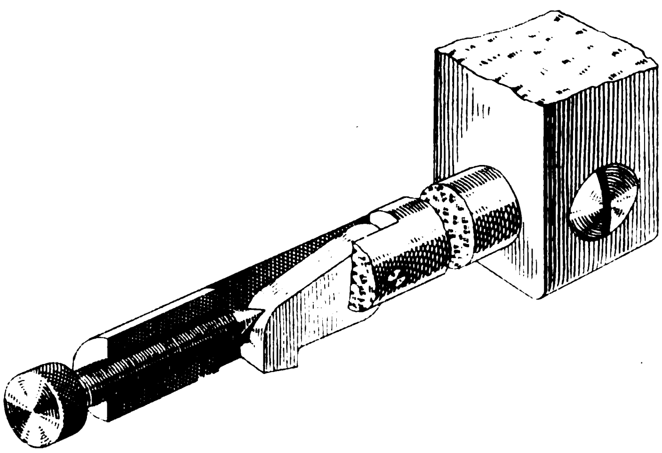
TOOLS MADE FROM BROKEN TAPER SHANK DRILLS

herewith. Lathe centers, combination center-drill and countersink, counterbores, end mills, Woodruff key-cutters, and many other similar tools may be made from these odd bits that are usually thrown away.

Cutting a Keyway in a Small Bushing

By Clarence B. Coe

A job that caused us considerable trouble was the cutting of a keyway ⅛ in. wide by 1/16 in. deep in a bushing 3 in. long and of ¼-in. bore. As there were



SPLINING TOOL FOR SMALL HOLES

but a few pieces a broach would have been too expensive and an ordinary splining tool out of the question because of the small diameter and length of hole. We finally disposed of the job with the tool shown in the cut.

A piece of ¼-in. drill rod about 5 in. long was slotted by drilling a series of ⅛-in. holes and filing to fit the cutter. A hole was tapped in the end for a ⅛-in. screw. The pin on which the cutter is hinged is 1/16 in. in diameter. This may seem like a very weak pin, but as the strain comes almost entirely on the screw, a small pin will stand up and will not weaken the bar as much as a larger one.

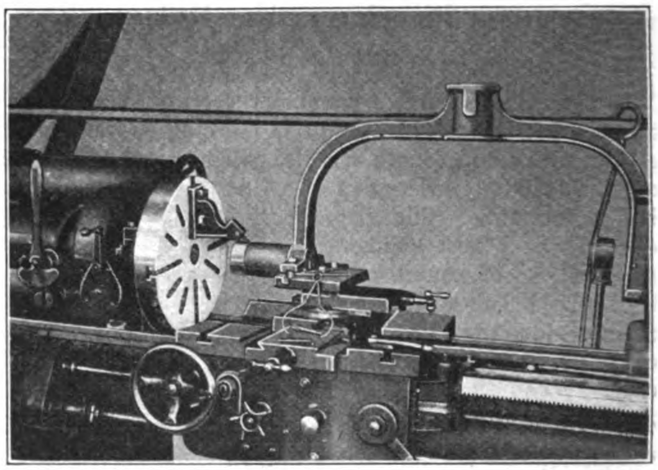
The cutter was made of ⅛-in. stock cut out to about the shape of the sketch. The screw is a stock screw with a 60-deg. point. The bar is held in a tool having a ¼-in. crosshole near the end.

A Large Job in a Small Lathe

By S. J. Morgan

The illustration shows how we turned the trunnions on a yoke for a concrete mixer, in a lathe much smaller than would have been required to swing the piece. This yoke was 48 in. long and the distance from center to outside was such that it would have required a 48-in. lathe to swing it. We used an 18-in. lathe.

Little explanation is required. We made a bracket to hold the toolbit and fastened it to the large faceplate of the lathe. One end of the work was bolted to the wings of the lathe carriage and the other was supported by the tail center, the foot stock being coupled to the



A LARGE JOB IN A SMALL LATHE

carriage and left loose upon the shears so that it would be drawn along later by the movement of the carriage.

The turned portions of the hubs were 3⅜ in. in diameter by 6½ in. long. The time was about one hour.

Testing Connecting Rods—Discussion

By Gus Haessler

The method of setting up for testing connecting rods described by G. A. Luers on page 382 of American Machinist, is a satisfactory one; but the use of a surface gage and scriber for the purpose is justified only when no better means are at hand, or when only one rod is to be tested, since the scriber does not register.

Any one of the small dial indicators now on the market may be attached to a surface gage or to a height gage by means of small C-clamps that may be purchased for little cost. Assuming that the wristpin and the mandrel in the connecting rod are true cylinders and are parallel to the surface plate, a dial indicator would show it by registering the same at both ends, while if they were not parallel the dial would indicate in thousandths of an inch the amount of error.

In testing work of the kind under discussion a height gage and dial indicator is preferable, and the latter may be attached to the scriber, or, by removing the scriber and yoke, it may be attached directly to the sliding jaw with one of the small clamps mentioned above. The indicator may be attached in a moment and with this combination the job may be done more conveniently.

Editorial

Getting and Using Trade Information

THERE are many indications that trade associations are destined to play a big part in the success or failure of individual businesses in any industry. This does not mean price-fixing associations, which are not likely to be tolerated under any circumstances, but associations which will study business conditions more thoroughly than can be done by any except the largest of individual concerns.

Anyone who endeavors to find accurate and comprehensive data concerning almost any industry will be amazed at the difficulty and at the meagerness of the facts he is able to muster. How many know the number of firms engaged in their own line of work, the total output in machines, the variety of shops which utilize them, or similar data? How many have any data, accurate or otherwise, as to markets for special machines?

Information of this kind can be satisfactorily collected and digested only by a well organized association or a government department. The latter, not necessarily through any fault of its own, is usually very slow. The strong trade association is in the best position to do this and to distribute the information promptly. The feeling seems to be growing that in either case the information must be made public, thus giving the greatest advantage to those who use it most intelligently.

There is, unfortunately, no sure way of getting these data into the minds of those who need them. Until business men realize that accurate, last-minute information of their industry is more vital to them than the stock market or the baseball score, industry and the country at large suffer, not to mention their pocketbooks.

An unopened and unread business paper on a manager's desk is an admission of inefficient planning of his working day. A study of the bank balance may have a more pressing appeal but, unless he also studies his industry as outlined and laid before him in his business papers and trade association bulletins, he may not have any bank balance to study.

Problems in Business Revival

THE hopes of those who had an abiding faith in the future of the country are beginning to be realized. Business is coming back, especially to those who go out and get it. Those who have decided that it cannot come before fall will probably find that to be true—for them. But when fall comes, they will be several laps behind those who go after business now.

Only the short sighted, however, will dream that their troubles and anxieties are over because business revival is under way. In reality they may have just begun. Not anxiety as to meeting the payroll and keepin the sheriff away, perhaps, but anxiety as to being able to manage the business so as to have it occupy its proper place in the industry.

The real manager must continue to look ahead, to build for the future as well as for the present, not in enlarging plant facilities, in many cases, but in manufacturing and sales methods and in both trade and industrial relationships. He will avoid price juggling so far as possible, as nothing is more fatal to steady business or the confidence of customers.

This is contrary to the doctrine of some economists who advocate an advance in price for every increase in demand. Practical considerations, however, make this inadvisable, especially at a time when business is on its painful way back to normal. Price changes should be as infrequent as possible as they shake confidence in stability, and confidence is especially desirable now.

Spiral or Helical?

IF YOUR hands were tied, could you explain the difference between a spiral and a helix? We think this a pertinent question, because movements of the arms seem to be necessary to the average individual in explaining the shapes of these curves. Because of the fact that the two terms are used so frequently in present-day practice, the difference should be well understood.

Before offering a definition, we might attempt to clear our way a bit by stating that we propose keeping to the real mathematical meanings of the terms. True, this action conflicts a bit with the ideas that are entertained by many a good mechanic and engineer. What is more, it conflicts with such authorities as Webster and many standard handbooks.

The confliction is justified, however, by the fact that the men engaged in a field requiring the accuracy of both thought and workmanship that building machinery entails, have need for the most mathematically correct nomenclature, as well as formulas. There is no wisdom in applying two terms interchangeably to two different things; we have need for a specific name for each. The tendency is all toward the precise usage of the terms spiral and helical, and eventually handbooks will not present them as synonyms.

Using the term in a mathematical sense, a helix is that curve formed on a cylinder by a straight line lying in a plane that is wrapped on the cylinder. The best practical examples are ordinary screw threads, worms and some types of reamers. A spiral, however, is the curve developed by a point moving about another point and continually receding from or approaching it. This type of curve is well exemplified by watch springs and scroll plates.

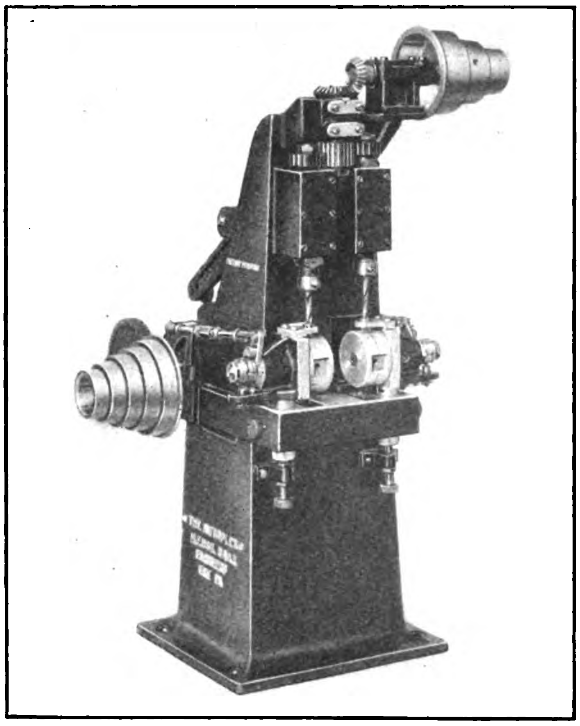
The difference between the two curves might be summed up in this way: For the spiral, the point about which rotation occurs is fixed, while for the helix it advances along a straight line. Furthermore, the radius to the revolving point continually increases for the spiral, but is constant for the helix.

The shop man wishes to be correctly informed and up-to-date on matters of nomenclature. However, he certainly cannot be blamed if his ideas are incorrect on this subject, when so frequently management does not give it sufficient consideration. Pay attention to the use of the terms, so that they are accurately applied, particularly when naming a tool or an operation.

Shop Equipment News

Barr "Autoplex" Drilling Machine

An automatic duplex drilling machine, designated as the "Autoplex," has recently been placed on the market by H. Edsil Barr, Erie, Pa. The machine, shown in the



BARR "AUTOPLEX" DRILLING MACHINE

accompanying illustration, is intended for high-speed drilling, reaming, facing, polishing and such operations on small parts made in large quantities.

There are two spindles mounted on the face of the column, each spindle rotating in a square guide block or quill. Noiseless gears at the upper ends of the spindles transmit power from the drive pulley. This pulley has three steps, so that the speed can be adjusted to suit either high-speed steel or carbon-steel cutting tools. The feed and the work chuck are operated by a separate five-step cone pulley mounted at the rear. One countershaft carries cone pulleys to drive both the pulleys on the machine.

The camshaft is mounted at the rear of the machine and geared to the cone pulley that drives it. It carries two pairs of cams, one for each spindle unit. Each large cam has a follower running on it and pivoted at the back of the frame; one of these followers can be seen at the left of the machine in the illustration. The end of the lever arm toward the spindle has a gear segment cut on it that meshes with a rack on the square spindle quill. The rise on the cam is uniform, so that the spindle feeds downward evenly. It has a quick drop, however, so that the spindle returns rapidly after the cutting stroke. The cams are so set that the spindles operate alternately.

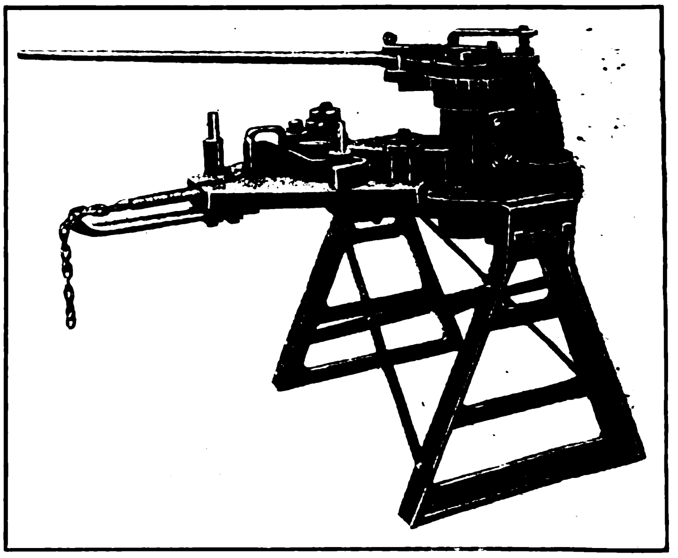
At the end of each camshaft is an internal cam connecting by means of a tie rod to the work-holding fixture. Each fixture head has four pockets to hold the work. The head is rotated one-fourth of a turn after each rise of its spindle. The rotation occurs when the internal cam pulls the side rod toward the rear. The forward movement of the side rod is without effect on the head, as this motion simply places the dog in position to rotate the head another quarter turn. The head is automatically locked in place while the drill is cutting. The position of each work head can be adjusted vertically by means of the handwheel beneath the head.

Ordinarily the work is carried on a sheet-metal container, and the operator feeds one head with each hand. The machine then does the drilling automatically and drops the parts into chutes leading to tote boxes placed at the rear. The heads are removable, so that special fixtures can be mounted. The machine can handle drills or reamers up to $\frac{5}{8}$ in. in size.

Bussel Universal Bending, Forming and Shearing Machine

A machine for bending, forming and shearing metal has recently been placed on the market by the Bussel Machine Co., El Paso, Texas. The machine is hand-operated and furnished in three sizes. The smallest size is intended for bench mounting; the medium size or No. 2 machine has only one bending post and no shearing plate or compound ratchet. The machine illustrated is the No. 3 size, is equipped for forming and shearing and has a compound ratchet lever.

No extra dies are required to bend any size of stock within the capacity of the machine. The stock is securely held so that it does not slip, no matter to what angle the bend is made. The machine operates either right- or left-handed and is operated by one man. The compound ratchet is not used for light work, the post



BUSSEL NO. 3 BENDING, FORMING AND SHEARING MACHINE

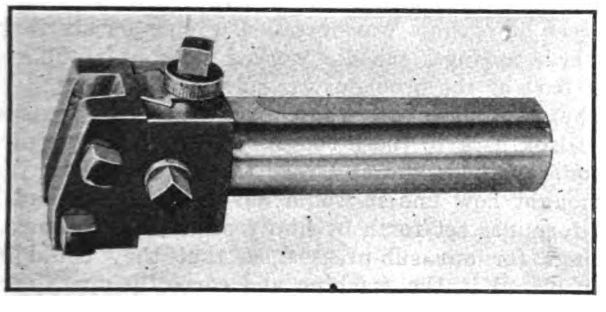
being equipped for direct pull. The work can be easily removed, although bent in the form of a complete square or circle.

Small holes in the table permit of adjustment of the attachments to the position desired. When the forming and shearing plate is removed, all sorts of work, particularly heavy bending, can be handled. The bending post has four edges and makes less than a quarter turn in producing a 90-deg. angle. Stock larger than can be placed in the bending post edge-wise, can be bent on the outside of the post. A 90-deg. angle can be bent accurately without the use of a square.

The No. 3 machine has two bending posts, one for light and one for heavy work. The small post permits of bending cold $\frac{1}{4}$ x 6-in. and $\frac{7}{8}$-in. round or square steel, and $\frac{5}{8}$ x 6 in. with a sharp corner hot. With the large post, $\frac{5}{8}$ x 6 in. can be bent cold, 1 x 6 in. with a sharp corner and $1\frac{3}{8}$ x 6 in. with a round corner when hot, and pipe up to 2 in. in diameter. The No. 3 machine weighs 840 pounds.

Warner & Swasey Adjustable Angle Cutter Holder

An adjustable angle cutter holder for use on turret lathes has recently been brought out by the Warner & Swasey Co., of Cleveland, Ohio. The purpose of the device is to eliminate uncertainty in adjusting cutters to close limits; an adjustment as small as 0.0005 in. can be made. A graduated adjusting screw operates a small cutter slide. The lock screw is ordinarily drawn up lightly and kept in that position, so that the adjustment can be made without changing the tension of the screw.



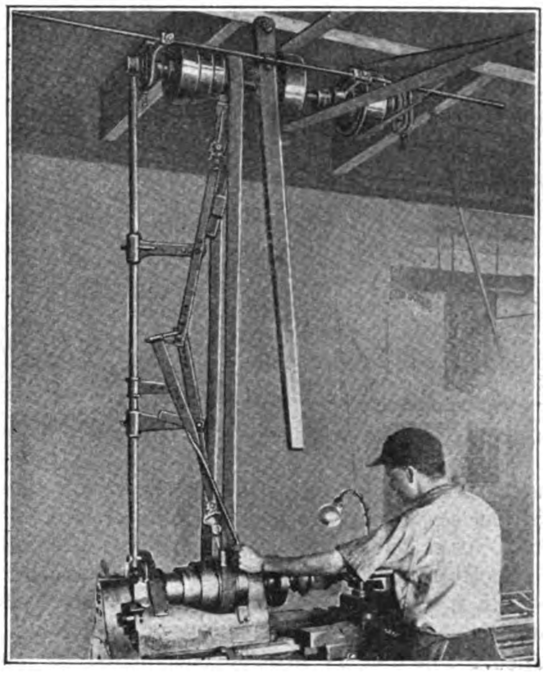
WARNER & SWASEY ANGLE CUTTER HOLDER

When turning to accurate size with a cutter head, at least two cuts must be taken over the surface. The roughing cut should be held within limits of 0.004 in., which can easily be done with a common toolholder by tapping the cutter lightly with a hammer. The finishing cut, however, requires considerable skill in adjusting the tool, to prevent moving the cutter too far and spoiling the work. The adjustable angle cutter provides a positive means of accurately setting the tool, so that the work can be easily turned to the proper diameter in the finishing cut.

The head is made of hardened steel. It is sufficiently strong to enable obtaining the same size on each piece, no matter if the conditions of operation be severe. In addition to obtaining the original setting quickly and easily, the exact size of the work can be maintained as the cutting edge wears down and as the machine warms up. It should be noted that cutter wear takes place especially on the first few pieces machined after grinding the cutter.

Kleckler Belt Shifter

In the accompanying illustration is shown the Klecker automatic device for shifting a belt on cone pulleys. The device has recently been placed on the market by the Keuka Industries, Inc., Hammondsport, N. Y. It is intended for use on all machines operated by belts running on cone pulleys, and it enables the speedy changing of the belt from one step to the other. Its principal feature is the fact that the belt does not slacken to a great extent during the shifting and does not permit of too much slowing down or actual stopping of the machine. Only one hand is necessary to operate it, and the operator can continue to give his attention to the work while shifting the belt.



KLECKLER BELT SHIFTER APPLIED TO LATHE

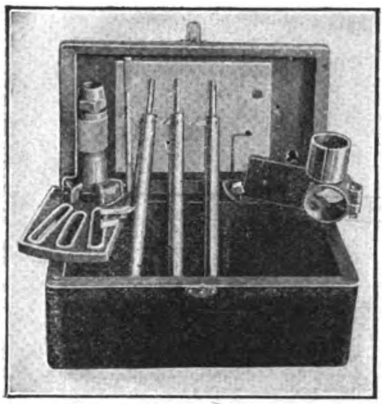
A loop fits the belt at both the countershaft and the pulley of the machine. Near each end of the mechanism is a weighted pendulum pivoted to the outer ends of the belt actuating levers. Gear teeth on the lever ends so mesh that pressure is exerted on the belt at that pulley on which the move is to be made from the lower to a higher step. The pendulums accelerate the action of the shifters. The belt directing loops are so pivoted that their sides remain parallel with the belt for all movements. This action prevents roughing and wearing the edges of the belt during shifting, so that its life is prolonged.

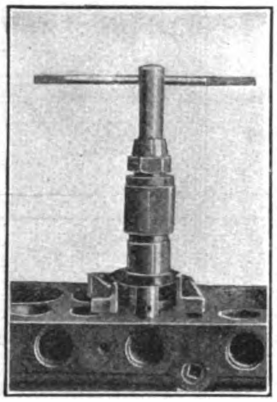
Steel lacings can be employed, since it is not necessary for the operator to touch the moving belt with his hands. The belt can be shifted almost instantaneously from one pulley to the other, or can be moved across the entire range of five speeds without appreciable stop on any one. It enables the machine operator to quickly attain the necessary speed for any operation, without the necessity of moving from his position in front of the work.

The device can handle belts from 2 to 5 in. in width on any standard machines. It can be applied to most lathes by securing it under the rear cap bolts. For especially long and heavy belts, heavier pendulums are provided.

"Davis" Valve Re-seating and Boring Tool

The Hinckley Machine Works, Hinckley, Ill., has placed on the market the "Davis" valve re-seating and boring tool for use on cylinder blocks of automotive





"DAVIS" VALVE RESEATING AND BORING TOOL

engines. The tool in operation is shown on the right side of the accompanying illustration. It will be noted that the cutter bar is not guided by only a small pilot at the bottom, but a large bearing above the valve seat holds it in place. This bearing is in a plate or holder that is clamped to the top of the block to be machined. The bar is inserted in the holder and the cutter put in place at the bottom of it.

The cutter bar is turned by hand. The side thrust is taken by the holder so that the seat is accurately cut. Feed is provided by a screw, so that digging-in, chattering or sliding over the surface is prevented. The cutters are lathe tools made of high-speed steel.

The tool will re-bore valve ports to a larger size, so that bigger valves can be employed. In renewing or enlarging ports, the contacting surface on the valve seat can be made narrower. This surface usually becomes widened after continual use and grinding so that carbon is apt to injure the seat.

The set consists of three boring bars, with $\frac{5}{16}$, $\frac{3}{8}$ and $\frac{7}{16}$-in. pilots, two valve seating cutters, one knurled handle to turn the cutters, two boring cutters, and a wrench for a hexagon setscrew. An attachment is provided for handling the valve cages of Buick motors. The parts are inclosed in a wooden case, as shown at the left of the illustration. The total weight is 18 lb., or 25 lb. when boxed for export.

A General Method for Spring Design—Discussion

By A. J. Strong

The article under the above title by Joseph Kaye Wood, on page 757, Vol. 55, of American Machinist, brought to my mind some experiences I had with springs twenty odd years ago while with the Western Electric Co. at West and Bethune Sts., New York.

At that time the Western Electric Co. made apparatus for the Western Union Telegraph Co., and decided to tool up for telegraph keys to show costs which would enable it to get this business which other concerns were getting on price. These instruments had a cast brass base with the key posts or uprights cast integrally. It was decided that these bases could be made at a cheaper rate and more neatly if they were punched from sheet brass and if the edges were finished by die shaving.

This new method was also applied to the key, which consisted of steel about $\frac{3}{16}$ in. in thickness, and 6 in. in length, and made quite a heavy job as compared with the run of press work we had been doing. It was on the dies for the key that we had our troubles with the springs.

We designed and built for each piece, four post sub-presses, placing the punch at the bottom, with shedders to push the punching back into the stock. The available press was rather limited in height for die room, so there was not space enough to work in springs of the length we preferred. For pushing out the punching we placed in the top member three springs of square section, making these of bar stock by cutting a thread on the outside and then boring out the inside until the spring section was equal or exactly square. The thread, of course, had been cut with a square tool. After tempering, these made very good springs.

Things progressed nicely until we placed our key job in the press to try it out, and then much to our sorrow we found that there was not push enough in our shedder springs to force the punching out of the die. We screwed the springs down to the limit and still they would not shed the punching as intended.

We pulled the job down and after a council of war decided to make an additional set of springs in the same way the first set was made, but with an outside diameter which would allow them to drop freely inside of the first set. It was further decided to make the holes in the second set small so the spring section would be rectangular and give more power. After this second set of springs was installed, giving us six instead of three springs, the die worked without trouble and that part of the problem was solved.

That was many years ago, as man's life is measured. As I look back to those rough days of the "rule of the thumb" methods and as I read the article by Mr. Wood, I thought how fine it would have been if we had had the formulas set forth by him from which to figure the springs for our sub-presses, so that they could have been placed in the machine and correctly operated the first time.

I have had some experience with formulas and systems in use at the present time, which fail to function if slightly overloaded, and which are presumed to be of assistance to business, and when I read Mr. Wood's article it occurred to me that possibly it may at least, in a general way, represent some of the ills from which present-day business is suffering.

Grinding Automobile Crankshafts

On page 505 appeared the statement: "for grinding a high tensile strength steel an aluminous abrasive is recommended, while a carbide of silicon wheel is suggested for low tensile steel. It is the physical and not the chemical properties of the *wheel* which are to be considered." In the last sentence the word "wheel" should read "metal."

Usually a silicon of carbide wheel is selected for low tensile strength material such as cast iron, chilled iron, brass, aluminum, marble, granite, etc. All steel is of such high tensile strength, relatively speaking, that it is best ground with grinding wheels made with aluminum oxide abrasives.

News Section

Change in Agricultural Appropriation Bill

The conferees on the agricultural appropriation bill in their report to the Senate and House state that they have stricken out the language proposed by the Senate appropriating $10,000 for the study of standardization of farm machinery. This language was to the effect that the investigation should be by the Department of Agriculture in co-operation with the Bureau of Standards of the Department of Commerce.

Railroads Report Fewer Freight Cars in Use

Freight cars idle because of business conditions totaled 529,884 on April 23, compared with 491,513 on April 15, or an increase of 38,371, according to reports just received from the railroads of the country by the Car Service Division of the American Railway Association.

Of that total, 371,764 were surplus freight cars, that is cars in good repair in excess of current freight requirements, while the remaining 158,120 were freight cars in need of repairs in excess of the normal number unfit for service.

Surplus coal cars totaled 229.892, an increase since April 15 of 41,974, while an increase within that period of 827 was reported for coke cars which totaled 3,669. Surplus box cars numbered 98,406, which was a decrease within approximately a week of 280 cars. Reports showed 16,114 surplus stock cars, which was a decrease of 3,317 since April 15 and miscellaneous cars also showed a decrease of 478 within the same time.

Indiana to Buy Road Machinery

The Indiana Highway Commission will soon purchase a quantity of road maintenance machinery. The machinery will be used largely to repair the damage done by floods over virtually every section of the state. The commission is asking for bids on from one to four portable stone crushers, with a capacity of 10 to 20 cu.yd. an hour; one to ten portable screening plants; one to three tar kettles of 100 to 200 gal. capacity; one to fifteen road rollers of the three-wheel variety and 10-ton weight; forty to one hundred and fifty wagon screens; six to twenty-five concrete mixers; ten to twenty road graders and two to four contractors' plows. The commission also will purchase from 100 to 200 drag scrapers and from fifteen to thirty-five wheel scrapers for use in excavating.

Thousands of dollars worth of public property was destroyed by the recent floods and the state is taking immediate steps to rebuild roads, bridges, wharves and dams.

European Conditions Main Topic of U. S. Chamber Meeting

The main topic of the tenth annual meeting of the Chamber of Commerce of the United States will be "European Conditions and Their Effect upon American Business." This meeting will be held in Washington, D. C., May 15 to 18.

Discussion of manufacturing questions will take place at two group sessions, which are being arranged by the fabricated production department of the National Chamber. The lowering of costs and stabilizing of production is a subject which will attract manufacturers to the first group session. This subject will be handled by a large manufacturer whose name will be announced later.

Another step in the reduction of economic waste will be taken by the discussion of simplifying variety and standardization. This subject will be presented by W. A. Durgin, of the Department of Commerce. An interesting report of cut-outs made in nearly fifty articles of common use will show the trend of this kind of economy.

Uniform methods of cost reckoning as an aid in expediting production is to be discussed by a Western expert who will show how it can be done.

The practical study of business cycles to increase continuity of employment is the subject with which Wesley Claire Mitchell, an economist of national prominence, will deal.

On the second day group meetings will discuss manufacturing problems as they relate to the general subject of the meeting.

This naturally divides itself into two principal divisions, the manufacturing situation in Europe and the importance of foreign trade to domestic production.

The merchant marine committee of the chamber was asked to examine the Hague Rules and report its conclusions. This committee has now presented a report in which it states that the Hague Rules represent an important step toward the definiteness and uniformity which are important both for shippers and ocean carriers and they should be supported.

The question of endorsement of the Hague Rules will be placed by the directors before this meeting for considerattion and such action as the chamber may think appropriate.

Bill for 8-Hour Day

Senator Moses, of New Hampshire, has introduced a bill in Congress to establish the 8-hour day, effective Jan. 1, next, in mines, quarries, mills canneries, workshops, factories or manufacturing establishments whose products enter interstate commerce. Violation of the law would subject the offender to a fine of not less than $100 and not more than $1,000, or imprisonment for one year or both.

Loans to Aid Export Trade Paid Back

The War Finance Corporation has announced that the advance of $5,000,000 to the Baldwin Locomotive Works, Philadelphia, Pa., made on Jan. 15, 1920, for the purpose of financing the exportation of locomotives, has been repaid in full eight and one-half months in advance of the date of maturity.

The corporation also announced that the advance of $4,000,000 to the International Harvester Co., Chicago, Ill., made in the spring of 1920 for the purpose of financing the exportation of agricultural machinery and implements, has likewise been repaid in full about one year in advance of the maturity dates.

Shipping Board's Plan

In a report to Congress analyzing the proposed plan of government aid to shipping, the Shipping Board states that considerations of marine design and construction justify the differential plan of government aid based on speed, tonnage and distance covered in the foreign trade, ranging from 2 cents per gross ton on ships making 13 knots an hour, to 2.1 cents per gross ton on those making 23 knots and over. The board points out that increased speed above 16 knots per hour involves a greater expenditure for high power machinery and greater cost of fuel consumed.

Farm Machinery Totaled Half Billion in 1920

Farm machinery to the value of $536,945,000 were manufactured in the United States during the year 1920, and all but $66,626,000 worth were sold at home, according to a circular just issued by the United States Department of Agriculture.

The extensive use in agriculture of farm machinery is clearly reflected in the circular. which contains definite information concerning the number and value of tractors, farm implements, vehicles, and other items of equipment; the extent to which farmers purchased different sizes and types, and the kinds and numbers exported. Data collected from 583 manufacturers were used in making up the tables. Figures are given for gas tractors, steam traction engines, plows and listers, and tillage implements, as well as planting, cultivating, haying, and harvesting machinery, machines for preparing crops for market use, and horse-drawn vehicles.

The circular also contains data on the various kinds of machines in the different classifications, from woodsaws to sirup evaporators. Although a few firms refused to give data on their business, enough was secured to make the figures dependable and fairly representative of the industry.

Spring Inspection Meeting of Connecticut Sections of A.S.M.E. and A.S.S.T.

About 250 people, members and friends of the Connecticut sections of the American Society for Steel Treating and the American Society of Mechanical Engineers were the guests of the New Departure Manufacturing Co., Bristol, Conn., on Saturday April 29. The group is shown in the picture below.

Assembling at nine o'clock, the party was divided into groups of fifteen, each group under the guidance of a member of the company's engineering or production staffs. The morning was devoted to an inspection of the plant, which was in full operation. Starting at the receiving sheds where the raw material is delivered directly from the railroad sidings, the parties were conducted through the extensive forge shops, the annealing and carburizing departments, and were given a glimpse of the chemical and physical test laboratories by means of which a close watch is maintained upon the quality of material entering into the New Departure product, which consists mainly of ball bearings.

Considerable time was spent in the heat-treating department, in which the members of the party were particularly interested, as it represents one of the most complete and up-to-date installations in existence for the automatic control of temperatures and heat periods.

A visit to the company's extensive ball plant followed, and from thence the party traced the evolution of a ball-bearing through grinding, assembling, inspecting and testing processes to the display rooms where every kind of bearing made by the company was on exhibition.

At noon a lunch was served in the cafe of the Endee Inn, and after an hour for rest and recreation the party was conducted through the administration building where the executive machinery of the company was explained to the visitors.

In the afternoon a mass meeting was held in the rooms of the Endee Club where F. P. Gilligan, national president of the A. S. S. T., presided. President DeWitt Page, in the name of the New Departure Co., bade the guests welcome, after which W. H. Eiseman, secretary of the A. S. S. T., delivered an address on the general subject of heat-treating, followed by an interesting talk on the "Fatigue of Metals," by Prof. H. F. Moore of the University of Illinois.

During the lunch hour the party was photographed on the lawn in front of the administration building.

SPRING INSPECTION MEETING OF THE AMERICAN SOCIETY FOR STEEL TREATING AND THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, CONNECTICUT SECTIONS, AT THE PLANT OF THE NEW DEPARTURE MANUFACTURING CO., BRISTOL, CONN.

Engineering Council Flays Patent Legislation

Pending patent legislation was denounced as "dangerous and destructive of the American patent system," before the Senate Patents Committee in Washington on May 1, by a delegation from American Engineering Council of the Federated American Engineering Societies. Edwin J. Prindle, of New York, chairman of the council's patents committee, voiced the protest of the engineers against the passage of the Stanley and Ladd bills, saying that the poor inventor would be injured and that the American patent system would degenerate into a position of the second or third class.

The bills attacked were the Stanley Bill, S-3325, providing for the granting of compulsory licenses where patents have not been worked to a reasonable extent within a reasonable time (which amended Section 4887 of the Revised Statutes of the United States); which bill was replaced by Stanley Bill, S-3410, which applied the same amendment to Section 4886 of the Revised Statutes.

The former Stanley Bill might, in effect, apply only to foreign-owned American patents, but the substitute bill would unquestionably apply to all United States patents, whether owned by American citizens or aliens. The questions of whether a patent had been worked to a reasonable time, are to be decided by the Commissioner of Patents or such other governmental agency as the President shall designate. The Ladd Bill, S-3297, was also introduced, and this bill provides that patents shall lapse if not worked within five years after they are granted, or two years after they have been assigned.

These bills would so lessen the value of patents that the incentive to produce inventions would be so greatly decreased as to put our American patent system in the position of a second or third class system and deprive our country of that incentive to invent which has made us the foremost country in inventiveness, in manufacturing, and in agriculture.

The object of the bills is to throw German-owned American patents open to American use and prevent the Germans from manufacturing in Germany and importing here, while restraining the use of their inventions here through their American patents.

Government Economy in Use of Machinery

Economies in government departments covering machinery during the year which will end June 30 have been reported to Congress by the Budget Bureau. There have been savings of $165,000 at the Frankford arsenal; $193,000 at Rock Island; $40,000 at the Aberdeen Proving Ground; and $92,000 at the Picatinny Arsenal. The Navy Bureau of Engineering reports a saving of $30,000 in the construction of a machinery plant at the Cavite, P. I., naval station, and a $9,000 saving in a plant at Olongapo, P. I. The Bureau of Standards reports savings in its invesigations on testing machines, mechanical apparatus and standardization.

The Navy Bureau of Engineering reports a saving of $90,000 in the fitting out of vessels, recently acquired from the Shipping Board, with pumps, evaporators, generators and refrigerating machinery, by employing used material.

The report was received with favorable comment in Congress.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

The spotlight of optimism was shifted from the Stock Exchange to the commodity markets last week. Grain, cotton, coffee, steel, copper, lumber, wool, silk, rubber, hides, and even burlaps with its humble parent, jute, are all in some degree higher.

Sugar is about the only important staple that showed a lagging tendency. This was due to the difficulties of a Cuban banking house whose failure was narrowly averted, but the fact that the much talked of Cuban surplus has been so rapidly distributed that stocks on the island are now down to last year's level suggests a situation to which the trade cannot long be oblivious.

Dealers in the other articles named explain the advance in each by reference to some technical influence, but to the student of underlying conditions an improvement which is so all inclusive has a significance that overshadows the details which would have been ignored if the public were not in a mood to interpret them bullishly.

Commodities Higher

Thus wheat is higher because it has suddenly been discovered that the season is late and the indicated demand for export large—but this is hardly news. Corn is slightly higher "in sympathy" with wheat, but sympathy is not a concrete thing—it is an emotion. In the South the temperatures have been low, the Mississippi has carried away some levees and the Government has published a statement which indicates that the consumption of cotton is or soon will be as large as it was before the war.

To these facts the sharp advance in cotton is attributed, but they have been known and pointed out for some time.

The advance in steel, copper and building materials is related to the increase in new construction but it has been stressed in these letters for weeks.

Silk is up from 30 to 50 cents a pound and some in the trade say that the advance is due to Japanese speculation, but the truth seems to be that American distributors have sensed a better demand for silk fabrics. Rubber is not much higher, but it is steadier on the increased demand for tires which has been for some time predicted.

Wool is worth more in America and the wool merchants say that the foreign markets are advancing, but the fact is that the improvement is a reflection of the world's increased purchasing power.

Coffee has recovered the decline recorded last week because the short time coffee loans to the Brazilian government have been refunded in a 30-year bond issue for £9,000,000, which is being offered simultaneously in New York and London. Inasmuch as it would appear that the 4,535,000 bags of coffee pledged for the security of this loan have all been bought and that no more can be purchased except as present holdings are sold the arrangement would not seem to be one that will further advance the market. But the public has preferred to regard it otherwise and those who could not be induced to buy coffee at six cents a pound are now taking it eagerly at ten cents.

The advance in burlaps and jute is attributed to a shortage in the supply that was known but unappreciated until a general improvement in trade which led to a demand for more bags and bagging brought it into relief.

But the improvement in the markets for raw materials has not yet reached the jobbing or the retail trade. It is still confined to the basic staples out of which the things that are sold over the counter are made.

There is and always will be a noticeable interval between activity in the raw materials and an increased distribution of the things into which they are converted by the processes of industry. This interval represents the time required for manufacture. Averaging it at two months the indicated revival in distributive trade is due about July 1 to 15 and it may be expected around that time unless there is widespread crop failure or some other great disaster.

There are many premonitory signs which justify a prediction so precise. In the drygoods market, particularly, many contracts for the future delivery of both cotton and woolen material are being made. Business is decidedly more active, but immediate delivery cannot be had because stocks are light.

Railroad earnings for March were at the rate of 6 per cent annually on the accepted valuation of the properties and the credit of the roads is so much improved that they are able to buy more equipment and make necessary improvements.

A better demand for mercantile credit, and bank clearings, which are now running more than 20 per cent over last year, are other evidences of increased activity. They lead me to again advise prospective borrowers to make their credit arrangements now. The weekly statement of the Federal Reserve System shows a decline of nearly 2 per cent in the reserve ratio which has fallen from 78.3 to 76.7 per cent.

Credit Expanding

For the first time in many weeks the gold held has not increased and the New York bank has in fact lost $24,000,000 of its gold which has been transferred to the other banks. This connotes an expansion of credit and circulation in the interior, and the strength of all foreign exchange except marks suggests that it is quite possible that we may soon have to export some gold against the European bond issues recently placed here and the expenditures of the many tourists who have gone or are going abroad this summer. In that event an immediate tightening of the money market may be anticipated, for our bankers have always been hypersensitive to a loss of gold.

There has been a slight lull in the security markets. Bonds are quieter and some stocks have shown a reactionary tendency but the oil shares are higher on the expectation of an advance in petroleum and the rails are daily becoming more responsive to rumors of consolidations that appeal to the public imagination with increasing force. From Chicago, for instance, it is reported that the Frisco system is negotiating for the purchase of the International & Great Northern, now in the hands of a receiver. I do not know that the report has any foundation in fact, but such a deal if carried out would bring another major railway system into being and the mere suggestion of it inflames speculation.

Then there are the operations of the Van Sweringen brothers of Cleveland. They have already acquired control of the Nickel Plate, the Lake Erie & Western and the Clover Leaf. They are pictured as Harriman's successors with an ambition to create a new trunk line in the central West by consolidation.

The idea may be fanciful but under present conditions it has plausibility and the public who are fond of romance in the railway world are ready to believe it. Their mood has changed and from having been unwilling to believe that prosperity would ever return they are now confident that it is here and will last indefinitely.

Signs Unheeded

The unsettled coal strike is therefore ignored. So is the textile strike. A bonus bill that will ultimately cost over four billion dollars seems to have lost its terror, despite the fact that the public debt increased $45,500,000 in April and the internal revenue decreased $875,000,000 during the nine months ending March 31, chiefly as a result of the falling off in income and excess profits taxes.

The practical failure of the Genoa Conference and a civil war in China are also unheeded, for the delusion that she is independent of the rest of the world is again taking hold of America.

It is the anasthesia of secondary inflation. The anasthetic is the gold we have been importing. We are just beginning to feel its effect. It will last as long as we can borrow easily and cheaply. There is no indication of its immediate ending and before it passes we may witness one of the greatest speculative movements that has ever swept the country.

Those who can go with the tide without surrendering themselves to it and being swept away will indeed be fortunate. The wisest men never try to get the top of the market.

The Trend of Business Improvement—Plants Resuming

The Missouri, Kansas & Texas Railroad Co. has resumed operations at its shops at Sedalia, Mo., following a shutdown since Jan. 19. The plant will be run on a piece-work basis, giving employment to about 500 men.

The Buick Motor Co., Flint, Mich., is increasing its production schedule for the second quarter of the present year, totaling about 40 per cent over the output for the first three months, or approximately 27,000 cars as compared with 19,000 in the January-March period. The company, a division of the General Motors Corporation, will take over the plant of the Scripps-Booth division at Detroit, and will operate an assembly unit at this point.

The Cleveland Tractor Co., Cleveland, Ohio, manufacturer of motor-tractors, has adopted a capacity schedule at its plant, with full working force operating under full time. Around the first of the year the plant was running at less than 40 per cent of normal.

The Packard Motor Car Co., Detroit, Mich., is increasing production 50 per cent in all departments, and will add about 1,000 men to the working force. The plant has been giving employment to about 5,500 operatives, an advance of 1,500 since the first of the year.

Durant Motors, Inc., New York, N. Y., has arranged a production schedule providing for a minimum of 200,000 automobiles during the next year, divided into 120,000 Star cars, and 80,000 Durant machines.

The American Car and Foundry Co. has increased production to a normal basis at its Memphis, Tenn., works, and the regular working force is being employed for the first time in many months. All other plants of the company are now on a capacity basis. A recent order includes 1,700 freight cars for the Chesapeake & Ohio Railroad Co.

The Verona Steel Castings Co., Verona, Pa., has resumed operations at its plant, following a shut down for more than a year. Employment will be given to about 800 men.

Following an increase in the manufacture of Knight motors to a basis of 100 a day, the Wilson Foundry and Machine Co., Pontiac, Mich., is planning to advance the output to 150 motors daily, a maximum production, with extra working shifts.

The American Tube and Stamping Co., Bridgeport, Conn., is arranging for the immediate resumption of operations at its steel plant, which has been closed for about fifteen months past. The company has adopted a capacity schedule at its cold rolling mills.

The Ford Motor Co., Detroit, has scheduled a production of 120,000 cars during May, making the highest output ever attained at the plant. From 5,000 to 8,000 men will be added to the present working force of 37,000 operatives. The former high mark in manufacture was in August, 1921, when the output reached 110,000 cars with the employment of approximately 40,000 men.

The National Acme Co., Cleveland, Ohio, has advanced production at its plant and is now running at better than 90 per cent of capacity. Further increase is expected at an early date. A large part of the output is devoted to radio equipment and parts.

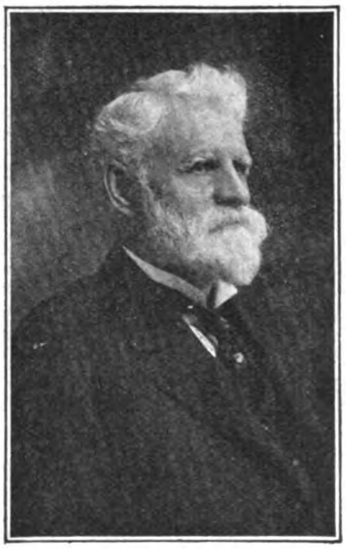
The Iron City Pipe and Foundry Co., Birmingham, Ala., has adopted a capacity schedule at its plant. A large portion of the present output is for shipments to South America and Cuba.

The Chevrolet Motor Co., Flint, Mich., a division of the General Motors Corporation, has inaugurated a night shift at its plant for the first time in a number of months. The plant is operating on a basis of 800 motors and 900 axles per day, with the employment of approximately 3,000 workers.

Ambrose Swasey Elected to Academy of Sciences

Ambrose Swasey, president of the Warner & Swasey Co., Cleveland, Ohio, was elected to membership in the National Academy of Sciences, at the annual meeting held in Washington on April 26.

The National Academy of Sciences is an organization incorporated by an Act of Congress on March 3, 1863, and approved by President Lincoln, to investigate, examine, experiment and report



AMBROSE SWASEY

on any subjects of art or science when called upon to do so by any department of the Government. Members of the Academy are grouped into committees of mathematics, astronomy, physics, engineering, chemistry, and others.

Mr. Swasey is also a member of the National Research Council, which was organized in 1916 at the request of President Wilson, under the charter of the National Academy of Sciences.

This honor was conferred upon Mr. Swasey more especially on account of his achievements in the design and construction of telescopes and other scientific instruments of precision. He established the Engineering Foundation and is an honorary member of a number of leading American and European scientific and engineering organizations, as well as an officer of the Legion of Honor, of France.

Chicago Letter

Business figures for the month of April show a slight increase over those of March and the first week of May has shown a further improvement towards an industrial revival. The increase in the number of inquiries and sales in the last few days, together with the fact that a number of large corporations are advertising extensively for help, shows that confidence has been restored to industry. There is no doubt in the minds of those who have followed past history that the next few years will make up for the years in which production has been at a standstill.

The Chicago, Burlington & Quincy has issued its long expected list which calls for approximately eighty machine tools. The Santa Fe has made a few additional inquiries and is expected to place orders shortly for a number of machines.

During the month of April permits for 1,315 buildings were issued in Chicago, calling for an expenditure of $17,078,560, which is about $2,000,000 lower than last month and a little less than $2,000,000 more than for the same month last year. The gain in number of buildings over last year amounts to 782. There is an evident increase in building activities among residential properties.

The New York Car and Wheel Co. recently purchased a fifteen acre tract adjoining the Standard Steel Car Co. plant at Hammond, Ind., for the reported sum of $18,000. This firm will start construction shortly on a $250,000 building which when completed will employ approximately 250 men. Gostlin, Meyn & Hostings, Inc., handled the deal and report having sold sites to two other big industries, details of which they will give out later.

Among the corporations formed lately are: Advance Radio Co., 169 N. Jefferson St., Chicago, to deal in and manufacture radio outfits and electrical appliances; Theodore Stone, 11 S. La-Salle St. is one of the incorporators. The Airphone Development Co., 111 West Washington St. was recently incorporated with a capital of $20,000 to manufacture and deal in radio equipment. The incorporators are Louis Grossette, W. E. Hooper and W. P. McCracken, Jr.

The Board of Education of Milwaukee, Wis., has issued a list of machinery for which it is in the market. The list is reported to be fairly large.

Longstreth Medals for Inventors

At the April meeting of Franklin Institute, of the State of Pennsylvania, the committee on science and the arts awarded Edward Longstreth medals to four men who have, through their improvements in scientific invention, aided the progress of industry.

The first award was made to Joseph F. Keller, of New York, for his invention of an automatic die cutting machine. Another award was to Samuel T. Freas, of Trenton, N. J., for his interlocking tooth saw. Medals were also presented to Charles F. Wallace and Martin F. Tiernan, of Newark, N. J., for their apparatus for the distribution of liquid chlorine for water purification.

Business Conditions in Germany

By OUR BERLIN CORRESPONDENT

A further drop of the exchange during March has acted as a powerful stimulant to buying, fanning it almost to a feverish heat. The eagerness to transfer paper money into goods on a rapidly rising market almost amounted to a panic. It seemed as though all the repressed and dormant demand was roused into action. The speculative element in this buying craze was very strong. The industries were almost overwhelmed with the rush of incoming orders. Everything within sight was soon sold; delivery times were stretched by months in quick succession, almost within a few weeks. Today it can be said that the larger part of the whole produce of the current year is disposed of. For a considerable number of products, especially those dependent on foreign raw materials, no quotations can be obtained, the long delivery time required putting such commodities entirely out of reckoning.

This applies to all lines of industry hardly without an exception. Even the building trade, which so far has been the Cinderella in German industry, is enjoying a strong revival of business. In the machine building industry, the leading works ask from five to seven months delivery, others three to four months. Such quotations are not always bona fide statements but frequently appear in the light of vague promises strongly guarded by a number of provisos. The chances of getting delivery in schedule time can be judged by the fact that according to reports of the Prussian Chamber of Commerce, many contracts for machinery, concluded last fall on the basis of a delivery of from two to three months, are not yet fulfilled.

Machine Tools Profiting

The present situation of the main branches of the machine building and metal industries can be briefly described as follows: The machine-tool industry is probably profiting most by the existing boom. The demand which at first tended strongly toward quality and specialties, has now extended to quantities, thus benefiting also the second and third ranks of the industry. Standard machinery, which during the first run of the boom last fall was still somewhat neglected, is now also drawn into the vortex of buying. Second-hand dealers have been able to clear a considerable part of their largely accumulated stock and are eagerly buying machinery where it is offered, even of the most obsolete types and in run-down condition. Prices paid for second-hand tools by dealers, which a while ago ranged from 5 to 15 m. per kilogram according to quality and size have now almost doubled. A hustle can be noticed in the market almost bearing a resemblance to war times, and discrimination in buying has been lost. Users are, however, drawing a distinct line against out-of-date designs. It is hard to see where the latter, which are still being made, although in greatly diminished quantities, go to. It can be noticed that the standard of requirements of the average buyer, which in earlier times showed signs of advancing to that set by the leading works, has again somewhat dropped. This is partly due to longer delivery quoted by the manufacturers of the best makes, and also to the fact that the gap in prices between those and the staple tools, which had visibly diminished, has again widened. It must be remembered that the prices for the best quality of tools, which also form the main contingent of the exports, have during the first half of last year been kept in check by the dictates of foreign markets, which pressure was later relieved by the exchange movement, again giving prices a leeway for expansion. Most orders from domestic sources are now placed on a sliding scale, moving in a certain ratio to the increase of cost of material and labor. The manmer in which such sliding prices are keyed to increase of cost varies greatly. The best scheme so far, judging from the favor it receives from buyers, seems to be to state the cost of labor and material at the time of the conclusion of the purchase, and to stipulate an increase of the price expressed in per cents for each 5 per cent of increase of wages and material. Foreign buyers rarely accept such an unstable basis for their purchases, and insist upon firm prices, thereby accepting a rather high percentage of risk which the manufacturer is forced to add to his price.

Prices of tools ranged at the beginning of April from 40 m. per kilogram for heavy tools, to 200 m. per kilogram for light precision machinery, like small automatics weighing 250 kg. Besides metal-working machine tools, all labor saving machinery is in great demand.

Power generating machinery is fairly well employed, mostly on orders for renewals. The locomotive industry is enjoying brisk business on light and medium size engines for private domestic orders and for export. The specifications of the state railroads have not yet been placed. Car building works are for that reason in a less fortunate condition. The difficulty is the demand of the railroad administration to contract on firm prices, to which the works find it difficult to accede. Shipyards are employed fairly well on repair work and new ships for the German mercantile marine. Tenders for foreign orders have, however, frequently broken down over the question of price. The automobile industries are exceedingly busy. The leading works are sold out almost to the end of the year.

The electrical industry is doing well in all branches, as great efforts are being made to increase the efficiency of power plants by replacing the existing equipment. The only striking exceptions in the wide field of the metal-working industries are the equipment for electric railways and railroad signal equipment.

Trend of Exports

The exports of machinery have increased since December, although not commensurate with the general rise of business. In February they had not yet reached the total of last July. The following figures show the quantities and value of the machinery exported from July, 1921 to February, 1922. The ad valorem figures are expressed in million paper marks. For the purpose of comparing them with gold mark prices, the average rates of exchange of the various months are shown in the third column.

	Metric Tons	Million Marks	Relation of Marks to the Dollar
1921 July........	39,792	790	77
1921 Aug........	29,036	619	84
1921 Sept........	28,757	611	105
1921 Oct........	26,626	647	150
1921 Nov........	27,989	808	263
1921 Dec........	37,484	1,703	192
1922 Jan........	32,695	927	192
1922 Feb........	39,257	1,254	208

As can be seen from the above figures, prices did not keep pace with the exchange movement. In gold marks the value of exported machinery is even decreasing. The gold mark price per ton, which in July was about 1,000 m., has in February dropped to 650 m. This is astonishing in view of the fact that a large part of the sales is effected in foreign currency, a procedure which has been adopted just for the purpose of making exports more or less independent of the fluctuations of the exchange. It is true that February shipments comprise many contracts concluded several months before on the basis of a better exchange, and before the ordinances to quote in foreign money came into force, but the fluctuations of the exchange were, at least in the last five months, not so large that they can satisfactorily explain the drop of the whole value of exports. The system of control of export prices has been greatly perfected, so it is claimed. Judging from the thorough way in which export licences have to pass, it must be assumed that they are handled with circumspection. It is difficult to see how a drop in the value of exports from 44 million gold marks in July to 25¼ millions in February, for approximately the same quantity, could pass unnoticed. It would seem, therefore, that either the system of export control or the statistical figures are faulty.

What has been said about machinery in general also applies to machine tools, although in a slightly lesser degree. For the latter, the following returns of the export business from July to February are given.

	Metric Tons	Million Marks
1921 July........	8,733	131
1921 Aug........	4,581	88
1921 Sept........	5,544	94
1921 Oct........	4,431	90
1921 Nov........	4,591	104
1921 Dec........	5,389	137
1922 Jan........	6,897	174
1922 Feb........	7,336	178

According to these figures, the average price per ton in July was 15,000 m. or approximately 830 gold marks, while in February it was 24,300 m. or slightly more than 500 gold marks. The latter price constitutes only half of the prewar standard, which was 1,000 m. per ton.

Compared with exports, the machinery imports are insignificant, especially when considering that the supplies from territories detached from Germany under the peace treaty are largely figuring in the imports. The latter are ranging from 200 to 1,000 tons per month. In the list of imported machinery, machine tools occupy the foremost position, machines for agriculture and for the textile industry following. Of the 198 tons of machine

tools imported during the first two months of the year, 81 tons came from America, 37 tons from Austria, and 25 tons from Holland. The latter are probably of American or English origin. The value of these imports is given as 9,300,000 m., or 47,000 m. per ton.

The business of the last few months has sufficed for the industry to recover from the whole previous period of depression, and beyond that to make great strides toward prosperity; so at least it appears on the surface. The inside situation presents, however, less healthy features, causing considerable anxiety.

Since January the living costs have risen by almost 40 per cent. The costs of material upon which the machine building industry depends, have increased almost in the same proportion. Mild steel bars, for instance, which a year ago were 2,440 m. per ton, which price decreased until June to 1,755 m., are now being sold at approximately 10,000 m. per ton. Even this price can hardly be maintained for any considerable time, as the prices of raw material are still moving up in a steep line, and are now approximately where semi-finished products were at the end of February. The dependence of the iron and steel industry on foreign ore supplies is making itself strongly felt. Scrap, which has been a balancing factor, is getting very scarce under the strain of industrial activity. The supply of iron ore has been somewhat eased by large contracts which have been placed on favorable terms for Canadian Wabana ore, and in a limited degree for Spanish ore. The effects of the recent large increase of the coal price are not yet reflected in iron and steel prices, the present level of which is based upon the price conditions of several months ago. It is instructive to compare such prices with those of finished machinery which were in force during the first half of last year. A lathe could then be had at approximately the same price per kilogram as raw castings cost now.

Summing up the situation, it is easy to see that the present industrial activity is taxing the country's financial strength to the utmost limit. Prices have already passed the limit set by the purchasing power of the populace. Every business has, by the buying craze into which the country has dropped so suddenly, been involved in a heavy risk, extending over many months, which can hardly bear any further addition. Manufacturers seem loath to cover themselves with raw material for future contracts. It must be borne in mind that the exchange has reached a dangerous level where a fluctuation of a fraction of a cent reported from New York expresses itself over here in many marks. Signs are visible that the buying wave has passed its crest. Moreover, it is now heard frequently from manufacturers that the industry cannot keep up its present intensity of production, and that the boom having reached a hypertrophical state, a reaction will soon follow. The eyes of the business world are now all turned toward Genoa, and although little is expected to materialize from this conference, it constitutes a strong element of uncertainty for business. The slender chance that something unexpected may happen, which might influence the exchange favorably, is sufficient to put some restraint on all enterprise and cause a temporary lull in business.

Navy to Sell Surplus Iron and Steel

The navy central sales office, Navy Yard, Washington, D. C., will receive bids up to 10 a.m., May 16, for the sale of approximately 350 net tons of iron and steel. The material is located in the Navy Yard at Norfolk, Va., and will be sold in accordance with the terms of sale as stated in catalog No. 83-B. The material is divided into lots and includes wrought iron, strap iron, bar steel, cold-rolled machinery steel in bars, galvanized bar steel, spring bar steel, reinforcing steel, tool steel and steel plate.

Proposals for any of the lots must be made on the authorized form which is attached to the catalog. Bids should be addressed to the officer in charge, Navy Central Sales Office, Navy Yard, Washington, D. C.

More Census Figures

From the recent report of the Bureau of Census we glean some information which should be of interest to manufacturers of machinery.

In 1920 machinists, millwrights and toolmakers numbered 894,662, compared with 488,049 as shown by the 1910 census report. The sub-divisions of the 1920 figure, shown in a special compilation about to be issued by the bureau are: Machinists, 801,901; millwrights, 37,669; toolmakers, die-setters and die-sinkers, 55,092.

The report also shows the total number of mechanical engineers, practicing their profession in 1920, was 37,689. In 1910 the figure was 14,514.

Some Statistics of Manufacturing Industries

In making a special report to the Senate Finance Committee, the Bureau of the Census shows that 521 establishments with an aggregate capital of $366,962,052 are engaged in the manufacture of agricultural implements. Salary and wage payments, when the last census was taken, totaled $88,630,177 annually. These plants have an aggregate horsepower of 128,249. They employ 303 steam engines, 31 steam turbines, 166 internal combustion engines, 72 water-wheels, and 7,993 electric motors.

The 315 automobile plants listed by the census represent $1,310,451,400 of invested capital. The salary and wage payments totaled $379,381,674 in 1919. The aggregate horsepower used was 287,323. These plants employed 170 steam engines, 24 steam turbines, 21 internal combustion engines, and 25,702 electric motors.

Cash registers and calculating machines were manufactured in 65 establishments, representing an invested capital of $82,798,293. The total salary and wage payments was $26,519,935.

Establishments engaged in the manufacture of motorcycles, bicycles and parts are shown by the report to number 51, with an invested capital of $25,362,150. Salary and wage payments total $12,963,593. The aggregate horsepower employed is 14,806.

Eighty-eight establishments with an invested capital of $47,794,300 were engaged in the manufacture of typewriters in 1919. Salary and wage payments totaled $21,079,171. The aggregate horsepower employed was 13,066.

Machinery Exports in March Exceed February

Exports of metal-working machinery increased sharply in March, when the value of foreign shipments reached $1,057,106. This is an increase of $341,861 over the exports of February, but is only one-half the value of similar exports in March, 1921. The increase may be accounted for largely by heavier shipments of lathes and machine tool parts. The detailed figures, which are those of the Bureau of Foreign and Domestic Commerce, are as follows:

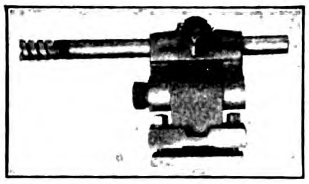
EXPORTS

	March 1921	March 1922
Metal working machinery	$2,321,553	$1,057,106
Lathes	337,856	106,561
Boring and drilling machines	....	51,097
Planers, shapers and slotters	....	19,885
Binding and power presses	....	13,511
Gear cutters	....	1,278
Milling machines	....	25,817
Sawing machines	....	3,262
Thread-cutting and screw machines	....	19,368
Punching and shearing machines	....	9,191
Power hammers	....	10,477
Rolling machines	....	7,067
Wire-drawing machines	....	968
Polishing and burnishing machines	....	1,989
Sharpening and grinding machines	95,645	56,584
Chucks, centering, lathe, drill and other	....	24,414
Reamers, cutters, drills and other parts	....	151,009
Pneumatic portable tools	....	23,641
Foundry and molding machinery	....	97,044
Other metal-working machinery and parts of	1,888,052	433,953
Road-making machinery	107,865	....
Mining, oil-well and pumping machinery:		
Rock drills	....	46,121
Mine hoists and derricks	....	2,826
Ore crushing and screening machinery	....	73,166
Amalgamation, flotation, etc., machinery	....	13,239
Smelting and roasting machinery	....	31,786
Other mining and quarrying machinery	760,452	445,737
Oil-well machinery	1,288,018	....
Pumps:	1,293,318	551,404
Centrifugal pumps	....	70,164
Steam	....	93,849
Other power	....	163,098
Hand	....	71,745
Other pumps and machinery	....	152,548
IMPORTS		
Machinery	992,672	979,807

Condensed-Clipping Index of Equipment

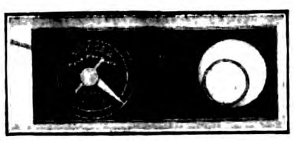
Patented Aug. 20, 1918

Toolholder, Boring, Swing
George W. Dover Co., Inc., Providence, R. I.
"American Machinist," January 19, 1922



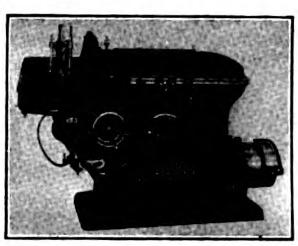
The holder is held to the lathe toolblock by two bolts and a strap that fits in the T-slot. The bearing about which the swinging member turns is parallel with the bar, and does not affect the parallelism of the cutter bar with the lathe spindle. The bar is secured by means of a yoke drawn up by a hexagon nut. An adjusting screw allows the bar to swing back for inspecting or calibrating the work. A double-lipped bar supplied with the device enables the operator to make two grindings at each trip to the grinding wheel.

Micrometer, Piston-Ring
D. F. Dunham, Oxnard, Cal.
"American Machinist," January 19, 1922



The micrometer is for use in piston ring factories and shops where cylinder regrinding and repairing are done. It is composed of a steel tape secured at one end to a pin and attached to a brass rack at the other end, the rack operating on a pinion. The work is placed within a loop of the steel tape in the opening at the right, and the handle at the left is revolved to tighten the tape on the ring. The size is indicated to 0.001 in. on the dial at the left. Rings from 2⅝ to 5$\frac{1}{16}$ in. in diameter can be gaged. Since the pressure on the tape closes the ring, its exact size can be determined.

Grinding Machine King, Automatic, Rotary-table, No. 25
Heald Machine Co., Worcester, Mass.
"American Machinist," January 26, 1922



The machine grinds such work as the sides of piston rings and ball and roller bearing races. It can be furnished with either an 8, 12 or 16-in. magnetic chuck, but the automatic feeding device is for the 8-in. chuck only. The feeding plate is indexed by a lever and is operated by a friction device. The wheelslide is driven by an hydraulic system to give any feed from nothing up to the maximum. When the machine is used without automatic feed, the chuck bracket can be adjusted to allow for grinding concave and convex surfaces. Wheel: diameter, 14-in.; face, ⅜ to 1½ in. Speed, 850 to 1,200 r.p.m. with 10 to 15 hp. Floor space, 90 x 40 in. Weight, 4,000 pounds.

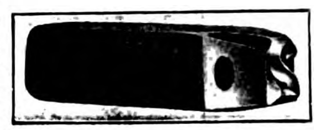
"Detectorod"
Bennett Metal Treating Co., Hartford, Conn.
"American Machinist," January 26, 1922

The device determines the atmospheric conditions in steel-treating furnaces, indicating when the furnace is in a reducing, or non-oxydizing condition, and when it is safe to introduce the work without scaling it. Its operation is based on the fact that a hydrocarbon gas is non-inflammable. The steel rod is about ½ in. in diameter, and has a hole 0.025 in. in diameter passing lengthwise through it. The handle is in two parts, one being a reservoir filled with kerosene oil and the other a pneumatic pump which creates the air pressure. If the jet of gas ignites, it indicates that too much oxygen is present in the furnace.

Reamer, Hand, Helical-Flute, Expansion
Millersburg Reamer & Tool Co., Millersburg, Pa.
"American Machinist," January 19, 1922

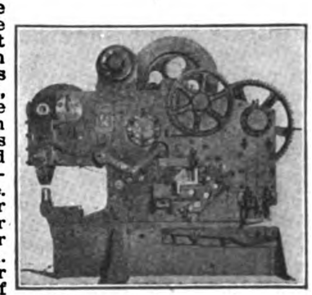
The reamer is furnished in all sizes up to 2½ in. in diameter. The helical flutes produce smooth and clean-cut holes of accurate size, due to the shearing action of the blades, and to the elimination of chatter. The blades may be expanded to compensate for wear and resharpening, thus maintaining the original size.

Stamp, Steel, "Super"
Pittsburgh Stencil and Tool Co., 40 Water St., Pittsburgh, Pa.
"American Machinist," January 19, 1922



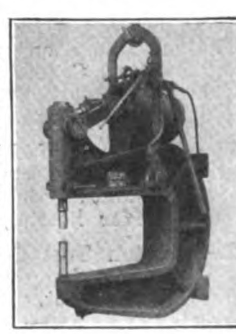
The stamp is used in stamping numerals or symbols in metal. It is made from a special quality of steel and heat-treated. The head is so tempered that it mushrooms and curls down until the pieces merely drop off under the blows, instead of splitting and flying. The end carrying the symbol is hard enough to stamp spring steel.

Punch, Shear and Bar Cutter; Diagonal Stroke; Armor Plate; No. 26
Buffalo Forge Co., Buffalo, N. Y.
"American Machinist," January 26, 1922



The machine can perform three distinct operations at one time without interference. It is not necessary to tilt the work when beveling or mitering. The punch is engaged by a handle or a treadle, the shear by a jaw clutch, and the bar cutter by shifting the ram with a counter-weighted lever. Angles up to 6 in. in size may be placed in the throat for trimming. A 7½-hp. motor operates the machine. Capacity: punching, 1¼ x ⅞ in., or 1 x 1 in.; shearing, ⅞-in. plates, or 3½ x 1-in. flats, with special upper knife, 8 x $\frac{5}{16}$ in., or 2⅞ x 1 in. flats; bar cutting, 2¼-in. round, or 2-in. square stock, 8-in. I-beams of 18-lb. weight.

Riveter, Pneumatic, Compression-yoke type
Southwark Foundry and Machine Co., Philadelphia, Pa.
"American Machinist," January 26, 1922



The machine has an operating valve of the plain slide type, with one wick packing on the stem end, and a removable valve seat. The pull-back is accomplished by the line pressure. Two separate pressures on the die are given by a plug cock in the valve plate. The portable machines are provided with suspension bails. When the machines have a reach above 36 in., feet are provided for mounting. Capacities, 10, 17½, 30, 50, 75, 100, 125 and 150 tons. Cylinder diameters, 7½ to 20⅝ in. Smallest size: reach, 4 in.; gap, 10 in. Largest size: reach, 21 ft. 6 in.; gap, 24 in.

Clip, paste on 3 x 5-in. cards and file as desired

Business Items

The Norton Company, of Worcester, Mass., has moved its New York office to 53 Park Place.

The name of the Wayne Oil Tank and Pump Co., of Fort Wayne, Ind., has been changed to the Wayne Tank and Pump Co. The organization and product remains the same. The company will market the Barromite water softening systems under the name of Wayne.

The Specialty Gauge and Tool Co., machine tool manufacturers, of Indianapolis, Ind., has filed papers with the secretary of state showing the intention of the corporation to dissolve.

The Minster Machine Co., Minster, Ohio, celebrated the fiftieth birthday of its general manager, A. L. Herkenhoff, with an entertainment and dinner in the plant offices on April 26. The event also celebrated Mr. Herkenhoff's twenty-sixth year as manager of the Minster shops.

The Alaskan Steel Co., Brown & Co., Inc., of Pittsburgh, and Heller Bros. Co., of Newark, N. J., have changed their Chicago office from 28 East Jackson Blvd., to 11 South Desplaines Street.

W. P. Ferguson and A. H. Sunderbruch, 204 Market St., Chattanooga, Tenn., have lately entered into partnership, trading under the name of the Hamilton Machinery Co. The firm will handle a general line of machine tools, boiler shop equipment, electric cranes, hoists, etc. Both members of the firm are old machine tool salesmen and are well known in the South.

Arthur M. Watkins, dealer in machine tools as Eastern agent for the Covington Machine Co., and New York agent for American Tool Works and Ohio Machine Tool Co., has removed his offices from 165 Broadway, to the Dodge Building, 53 Park Place, New York City.

The American Patent Law Association, 614 Washington Loan and Trust Bldg., Washington, D. C., has issued a pamphlet setting forth the testimony of inventors, manufacturers and others on the Stanley compulsory patent bill (S. 3410). The pamphlet will be sent to anyone interested, upon application to the association.

The Campbell-Davenport Co., Inc., has been organized and has opened a garage and machine shop at 55 Smith St., Brooklyn, N. Y.

The machine shop of the Jones & Laughlin Steel Co., in Pittsburgh, Pa., was badly damaged by fire on May 3. The damage is estimated at $60,000.

The Markey Machinery Co., of Seattle, Wash., has converted part of its plant in that city to the manufacture of boilers for heating plants.

The Wilton Tool Co., Sharon, Pa., has started work on a machine shop addition to its plant.

The Sharon Pressed Steel Co., of New York, has removed its offices from 66 Broadway to the warerooms in the Dodge Bldg., at 47 West Broadway.

The Herberts Machinery and Supply Co., of Los Angeles, Cal., has been appointed the exclusive representative in California, Arizona and Nevada for the Norton line of grinding machines.

The Joseph Hollander Manufacturing Co., 172 Wade St., Bridgeport, Conn., manufacturers of hardware and metal specialties, has filed a voluntary petition in bankruptcy. Liabilities are $16,081, and assets $1,650.

J. L. Purcell, Inc., 40 Trumbull St., Hartford, Conn., has been incorporated to carry on a general mill supply business at the above address. The company will take over the present business of J. L. Purcell, which is well known in Connecticut. The new concern will have a capital stock of $100,000. J. L. Purcell, F. J. Murphy and E. M. Day, all of Hartford, are the incorporators.

Banigan Manufacturing Co., of Killingly, Conn., has recently been incorporated to manufacture and deal in tools, machinery, and such products. The capital stock of the company is $50,000, and the incorporators are; J. J. Banigan, Providence, R. I.; Richard D. Banigan, 43 Broad St., Danielson, Conn.; and E. Banigan, also of Danielson.

The West Border Spring Co., of Chelsea, Mass., has been organized with a capital stock of $25,000, to manufacture springs, etc. Herbert T. West, 17 Chestnut St., Winchester, Mass., is president and treasurer of the new concern.

The Budd Wheel Co. has purchased the Government plant at Philadelphia, formerly occupied by the Hero Manufacturing Co. The plant will be arranged to manufacture Budd wire wheels.

The Precision Die Castings Corporation, which has had a plant at Fayetteville, a short distance from Syracuse, N. Y., has been sold by C. Hamilton Sanford, as receiver, to Frank E. Wade for $27,500. The details of re-organization have not been decided upon. Mr. Wade represented the creditors. The reorganized company will operate the Fayetteville plant which normally employs about 200 men. Officers of the new company are: F. E. Wade, president; J. Wiltsie Knapp, vice-president and general manager; H. W. Smith, secretary and treasurer. Frederick P. Assman heads the board of directors.

The McCabe & Sheran Machinery Corporation has moved its sales office from 149 Broadway to 50 Church St., New York City.

Personals

Basil Miles, who was secretary to the American delegation at the Limitation of Armament Conference, has been appointed administrative commissioner for America at the headquarters of the International Chamber of Commerce in Paris. Mr. Miles succeeds Frederick P. Keppel, who has resigned.

E. M. Wagner, of the Runecke Wagner Pump and Supply Co., Pittsburgh, has been elected president of the recently organized Manufacturers Club of Pittsburgh, which has purchased the Hotel Chatham, Pittsburgh, for its home.

John N. Weir, assistant superintendent of the Eliza Furnaces, Jones & Laughlin Steel Co., Pittsburgh, Pa., has resigned to accept a position as superintendent of blast furnaces for the Pittsburgh Crucible Steel Co., Midland, Pa.

Henry P. Rankin, at one time connected with the Pittsburgh Crucible Steel Co. as superintendent of construction and later in charge of mill at Midland, Pa., and who for the past few years has been Pittsburgh manager for the H. M. Johns-Manville Co., has been appointed manager for the latter company in the Cleveland and Pittsburgh districts, with headquarters in Cleveland.

J. W. Hartman, formerly with the R. K. LeBlond Machine Tool Co., is now South-western manager for the Eccles & Smith Co., with headquarters at Los Angeles, Cal.

R. A. Case has been appointed general sales manager of the Eccles & Smith Co., with headquarters at San Francisco, Cal.

Obituary

John R. Sherwood, sales manager of the Singer Manufacturing Co., manufacturer of sewing machines, Bridgeport, Conn., died at the Bridgeport Hospital on April 26, from the effects of a recent operation. Mr. Sherwood, was well-known in industrial circles in New England and New York.

Edward T. Brown, retired manufacturer of cotton ginning machinery, died at his home in New London, Conn., on May 2. He was eighty-three years old. He was the founder of the Brown Cotton Gin Co., and was its president for many years.

Joseph H. Brightman, assistant secretary and treasurer of the Brightman Manufacturing Co., South Columbus, Ohio, died at his home in Columbus on April 21. He was thirty-five years old. Mr. Brightman had been engaged in the manufacture of shafting machinery for eleven years.

Forthcoming Meetings

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

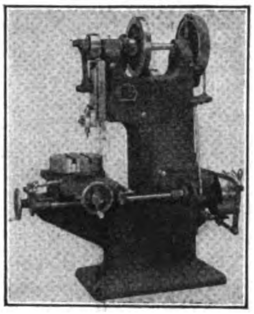
Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

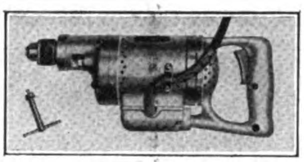
Patented Aug. 20, 1918

Slotting Machine, Die, Vertical
Peters-Bossert Co., 617 East Pearl St., Cincinnati, Ohio.
"American Machinist," January 26, 1922



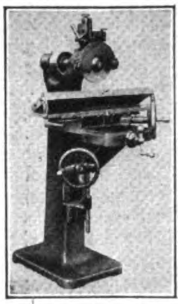
The machine is used in making dies and punches of either regular or irregular shape, and is fitted with a special mechanism for producing a curved relief on the die. The ram slides in vertical ways, is fitted with a gib, and is driven by a crank on the main shaft, with an adjustable crankpin to vary the length of stroke from zero up to 4 in. The machine has cross, longitudinal and circular hand feeds, each operated by a separate screw and handwheel. Power feeds may be furnished when desired. A variable-speed gear box inside the frame gives three changes of speed operated by a lever.

Drill, Electric, Portable, Automatic, "Willey"
James Clark, Jr., Electric Co., Louisville, Ky.
"American Machinist," January 26, 1922



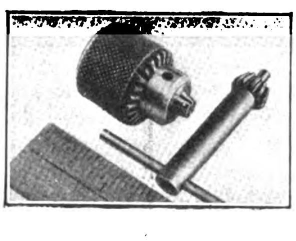
The device is used for production work with small sizes of twist drills. It is made in three sizes to hold drills up to 3/16, 1/4 and 5/16 in. The switch for operating the motor is controlled by the grip on the handle. The motor may be wound for either 110 or 220-volt alternating or direct current, single-phase of 60 cycles or less. The tool consists of the spindle with gears, motor body, and handle with the automatic switch. Length, with a Jacobs chuck, 11 5/8, 12 1/4 and 13 1/4 in. respectively. Weight, 6 1/4, 7 and 7 3/4 pounds.

Grinding Machine, Surface, Tilting-Table, Hand-feed, No. 1
Wilmarth & Morman Co., Grand Rapids, Mich.
"American Machinist," January 26, 1922



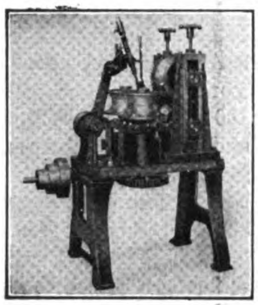
The machine is adapted to grinding small work on a magnetic chuck in finishing surfaces at angles. The chuck is bolted to the table, which is then tilted to the required angle. The table is provided with T-slots for holding a magnetic chuck, vise or other fixtures, and is graduated in degrees. The truing device on the wheel hood dresses the grinding wheel horizontally or at any angle. A radial truing device which operates from the table can also be furnished.

Chuck, Drill, Small, No. 0
Jacobs Manufacturing Co., Hartford, Conn.
"American Machinist," January 26, 1922



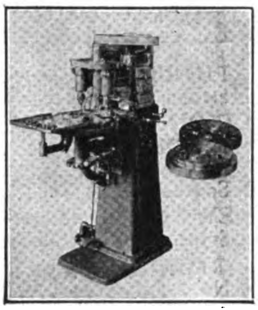
The chuck holds small drills used by jewelers for the drilling of small holes. It is 1 1/4 in. long and measures 7/8 in. in diameter. It can be furnished with a sleeve of even smaller diameter, so that the chucks may be run in multiple at 3/4-in. centers. In this case the sleeve is not knurled. Maximum capacity, 1/8 in. Weight, 2 ounces.

Welding Machine, Tube, Oxy-acetylene
Davis-Bournonville Co., Jersey City, N. J.
"American Machinist," January 26, 1922



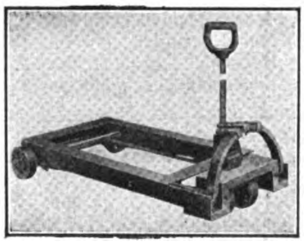
The machine is used in tube making for long runs on one size of tubing. It is equipped with two pairs of rolls, one set for feeding, and the other for welding. The welding roll at the back is fixed in place. The front one is adjustable, and its spindle bearing is in a slide controlled by a screw and handwheel. The upper and the lower feed rolls are geared together. A multiple-jet, water-cooled torch is employed. Maximum capacity is for tubing 6 in. in diameter and of No. 10 gage. Welding can be done on more than one size of tubing with any one machine.

Tapping Machine, Dial-Feed, Multiple-Spindle
Anderson Die Machine Co., Bridgeport, Conn.
"American Machinist," January 26, 1922



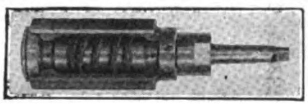
The machine is equipped with three spindles, and is used in tapping small brass and steel pieces. The chief feature of the machine is a dial for feeding the work to the spindles. The spindles are driven in opposite directions by a toothed segment and train of gears. The segment is controlled by a crank disk at the upper end of the vertical shaft, to which are secured the cams for indexing the dial and for locking it in its proper position. The machine when holding from No. 4 to No. 10 taps is ordinarily run at a speed of 56 strokes per minute. Either one, two or three holes can be tapped in each piece.

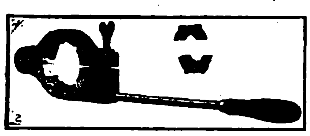
Truck, Lift, Hand-operated
Western Tool and Manufacturing Co., Springfield, Ohio.
"American Machinist," January 26, 1922

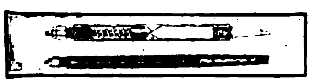


The truck is made of iron and steel, and can be turned in its own length, the front wheels swiveling about a ball thrust bearing. Roller bearings are employed on all wheels. With the truck one man can raise a load of 2,000 lb. The lift of the platform is 1 1/4 in. The platform is ordinarily 23 x 38 in. in size, and 7 1/4 in. above the floor when raised.

Lapping Tools, Internal and External, Replaceable Shell
R. & C. Lap Co., Davenport, Iowa.
"American Machinist," January 26, 1922







The laps are used in tool making and production work in the shop. The abrasive shells are supplied in two grades. The laps are made for both external and internal use in sizes from 1/4 in. up. In Fig. 1 is shown the cylinder lapping tool, consisting of a floating shank and an expanding device for adjusting the size, as well as for taking up the wear. In Fig. 2 is shown an external lap for use on crankshafts. A small internal lap is shown in both the sectional and the full view in Fig. 3. The lap is made with a standard shank, and may be fitted in a lathe or drill press, or operated by hand.

Clip, paste on 3 x 5-in. cards and file as desired

The Weekly Price Guide

THIS WEEK'S MARKET

Advances—A leading dealer in shop supplies at New York, issues new price card quoting rivets 20c. higher on 100 lb. lots; active Spring demand also caused nuts, washers and screws to advance. Pig iron quotations in all cities are given at from $1.50 to $3.50 higher, Pittsburgh quoting No. 2 Foundry at $21.30; Basic, $23.00, and Bessemer, $23.96. Chicago sends new prices of iron machinery castings: Light, 5c.; Medium, 4.5c., and Heavy, 3.5c. Linseed oil at 95c.

Declines—Open hearth spring steel (base) New York, at 3.50c.; coppered bessemer rods fell 50c. from 7c. Tin, 5-ton lots at New York, at $31.50. Zinc is firm.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21.50
Northern Basic	23.52
Southern Ohio No. 2	25.02
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.56
BIRMINGHAM	
No. 2 Foundry	17.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	25.40
Virginia No. 2	28.24
Basic	23.50
Grey Forge	24.46
CHICAGO	
No. 2 Foundry local	22.00
No. 2 Foundry, Southern, sil 2.25@2.75	23.92
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.30
Basic	23.00
Bessemer	23.96

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.5	5.0	3.0
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Denver	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.40	3.38	3.15	3.38
No. 12	2.45	3.43	3.20	3.43
No. 14	2.50	3.48	3.25	3.48
No. 16	2.70	3.58	3.35	3.58
Black				
Nos. 17 and 21.	3.00	4.05	3.55	4.10
Nos. 22 and 24.	3.05	4.10	3.60	4.15
Nos. 25 and 26.	3.10	4.15	3.65	4.20
No. 28	3.15	4.25	3.90	4.30
Galvanized steel sheets:				
Nos. 10 and 11.	3.15	4.25	3.75	4.30
Nos. 12 and 14.	3.25	4.35	3.85	4.40
Nos. 17 and 21.	3.55	4.65	4.15	4.70
Nos. 22 and 24.	3.70	4.80	4.45	4.85
No. 26	3.85	4.95	4.60	5.00
No. 28	4.15	5.25	4.90	5.30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	3.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.50	8.00	6.03
Hoop steel	3.38	2.81	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.70	4.66	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2.58	2.41	2.38
Soft steel bars (base)	2.48	2.31	2.28
Soft steel bar shapes (base)	2.48	2.31	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.58	2.41	2.38
Bar iron (2.00@2.10 at mill)	2.48	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
$\frac{3}{32}$	8.00		12@13
$\frac{1}{8}$	6.50		11@12
$\frac{5}{32}$ to $\frac{1}{4}$	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.62½
Tin, 5-ton lots, New York	31.50
Lead (up to carlots), St. Louis, 5.40; New York	5.75
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.75	6.25
Copper sheets, base	19.50@20.50	19.50	23.00
Copper wire (carlots)	14@14.25	16.00	16.25
Copper rods (ton lots)	17.75	21.00	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	15.75	17.00	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	13.75	15.00	15.75
Brass wire (carlots)	16.25	17.75	.....
Zinc sheets (casks)	8.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....
Solder (½ and ½), (caselots)	23.00	22.00	19.00
Babbitt metal (fair grade)	30.80	39.50	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	11.75	10.25
Copper, heavy, and wire	9.50	10.75	9.25
Copper, light, and bottoms	8.50	9.00	8.25
Lead, heavy	3.75	4.50	3.65
Lead, tea	2.75	3.25	3.00
Brass, heavy	5.75	6.00	8.00
Brass, light	4.25	4.50	4.75
No. 1 yellow brass turnings	5.00	5.50	5.00
Zinc	2.75	2.50	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	\$0.07½@\$0.10	\$0.12	\$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13½x13½	....	50.00	55.00
Wiping cloths per M., 13½x20½	....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.95	.95	.99
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville...per net ton		\$3.25@\$3.50	
Coke, prompt foundry, Connellsville...per net ton		\$4.25@\$4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	55%	60–10%	60%
1⅛ and 1¼x3 in. up to 12 in	40%	60-10-10%	60-10%
With cold punched sq. nuts	40%	....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	....	\$4.00 off
Button head bolts, with hex. nuts	30%	\$3.90 net	.....
Hex. head and hex. nut bolts	35%	....	65-5%
Lag screws, coach screws	55%	....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in	45%	60-10%	50–5%
Bolt ends, with hot pressed nuts	55%	....	55%
Tap bolts, hex. heads	+10–15%	....	.....
Semi-finished nuts ⅝ and larger	70%	75–10%	80%
Case-hardened nuts	65%	....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	\$4.50	\$3.50	\$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	2.50	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	2.50	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	2.50	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	2.50	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	60-10%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	\$3.70	\$3.25	\$3.00
Cone heads, ditto (net)	3.80	3.35	3.10
1¼ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	....	0.15
⅝ in. diameter *EXTRA*	0.15	....	0.15
½ in. diameter *EXTRA*	0.50	....	0.50
1 in. long, and shorter *EXTRA*	0.50	....	0.50
Longer than 5 in *EXTRA*	0.25	....	0.25
Less than 200 lb *EXTRA*	0.50	....	0.50
Countersunk heads *EXTRA*	0.35	......	\$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	......

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	\$0.65	\$0.50	\$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40-10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	\$5.84	\$3.85	\$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Cal., Oakland—Kingiving Co., 5522 Carlton St.—one automatic or hand operated turret lathe hollow spindle to take 4½ in.; one automatic or hand operated turret lathe with hollow spindle to take 6½ in.; metal band saw, Napier preferred; one small plain mill; any quantity of cold drawn steel tubing, 3 in. to 6½ in. OD., at least 1/16 in. wall thickness, any lengths—butt ends will do.

Conn., Bridgeport—The Amer. Fabrics Co., 1069 Connecticut Ave., W. Lloyd, Purch. Agt.—one No. 1, 10 in. x 24 in. universal grinder; one No. 2, 18 in. x 6 in. x 9½ in. surface grinder, equal to Brown & Sharpe, (used).

Conn., Springdale — The Segal Metal Products—grinders, stamping machines, etc., for machine shop.

Ill., Chicago—The Amer. Steel Foundries, McCormick Bldg.—one 5 ft. radial drill variable speed motor drive; one 20 in. x 14 ft. and one 24 in. x 14 ft. lathe, both belt driven.

Ill., Chicago—G. Hanson, 2642 North Mogart St.—punch press similar to Bliss No. 19, 20 or 21, and one 16 in. shaper.

Ill., Chicago—K. Wright, 1225 East 44th Pl.—one 200 lb. Bradley helve hammer.

Ill., Kewanee—The Walworth Mfg. Co., P. O. Box 317, R. W. Gamble, Kewanee Wks. Purch. Agt.—one 36 in. simplex radial drill with tapping attachment.
One 24 in. x 60 in. duplex vertical milling machine.
One 48 in. New Era type bullard vertical lathe.
One 16 in. surface grinder with magnetic chuck, 220 volts.
One 3 in. x 10 in. flat turret lathe.
One 28 in. x 11 in. heavy duty turret lathe.
Three 10 in., 12 in., 14 in. or 15 in. x 54 in. turret lathes.
One 20 in. x 8 ft. heavy type turret lathe.

Ill., Rockford—The Barber Colman Co., H. W. Balls, Purch. Agt.—two No. 4 Lees Bradner thread millers, 14 in. between centers, 10 in. swing one Brinnel Hardness testing machine 3,000 kw.; one Ericksen machine for testing sheet; one Universal testing machine, 3 or 4 screw type of 50-100,000 lb. (25-50,000 kg.) capacity with automatic and autographic beam.

Mich., Detroit—The General Steel Mchy. Co., 2530 Taylor Ave., A. L. Tushbant, Purch. Agt.—miscellaneous machine tools for general machine work.

Mich., Detroit—The Monroe Sheet Metal & Welding Co., 850 Porter St.—metal working equipment.

Mo., Joplin—The Dunn Auto Shop, 715 Virginia Ave., J. J. Dunn, Purch. Agt.—power lathe, drill press and emery wheel.

Mo., Joplin—The Jeffries Grading Co., 1514 Main St., B. C. Burges, Purch. Agt.—wood lathe for power machinery.

Mo., Joplin—The Joplin Radio Shop, 422½ Main St., J. J. Graber, Purch. Agt.—electric power punch for copper, brass and soft metal work.

Mo., Joplin—G. Kost, 802 Main St.—lathe for motorcycle repair work.

Mo., Joplin—Loomis & Banon, 210 West 15th St., C. Loomis, Purch. Agt.—lathe for garage.

Mo., Joplin—W. Zook, 1601 Grand Ave.—drill press, lathe and emery wheel for automobile repair work.

Mo., St. Louis—The Brown Mchy. Co., 2323 North 9th St., A. Brown, Purch. Agt.—band saws, 20, 26 and 36 in.; coping lathes; rip saws and matcher; 30 x 6 in. double surfacer; borers; trimmer; edgers; saw mills; log saws, wood saws for power machinery.

Neb., College View—The Service Garage, C. Gipson, Purch. Agt.—Weaver press and one 3-wheel Weaver jack, (used).

N. H., Keene—The Humphrey Machine Co., manufacturer miscellaneous machinery—one milling machine similar to No. 4 Cincinnati; one Wolcott screw cutting engine lathe 16 in. x 8 ft.; one 16 in. Wolcott crank shaper.

N. Y., Binghamton—R. J. Bump Co., Wall St.—bench miller and vertical post drill.

N. Y., Buffalo—McKaig-Hatch Inc., 1584 Niagara St.—machines and equipment for proposed machine shop on Skillen and Ontario Sts.

N. Y., Geneva—W. L. Parkard—modern screw cutting lathe, 32 in. swing, 8 ft. between centers.

N. Y., New York—The Electric Motor & Mchy. Co., 250 East 43rd St.—3 electric motors, 4 drill presses and several lathes.

N. Y., New York—The Elk Manufacturing Co., 1926 Bway., experimental work—magnetic chuck, demagnetizer and internal grinding attachment for No. 13 Brown and Sharpe Universal grinder.

N. Y., Rochester—W. P. Farley, 1005 Harvard St.—machinery and equipment for proposed machine factory.

N. Y., Watertown—G. Bushnell, 621 Lansing St.—lathe, 14 in.-18 in. back geared; drill press; bench miller and portable electric drill; small tool equipment for shop for motor repairs and small machine work.

O., Cleveland—The A. & B. Box Co., 8628 Woodland Ave., H. C. Roberts, Secy.—band saws, lathes and box nailers.

O., Columbus—The Columbus Heating & Ventilating Co., 1125 West Town St., C. A. DaMonte, Secy.—several pieces of metal working machines.

O., Columbus—The Miller-Van Horn Co., 81 East Main St., J. Van Horn, Purch. Agt.—one drill press and one grinder.

Pa., Beaver Springs—J. A. Catherman, (woodworker)—hollow chisel mortiser.

Pa., Meadville—P. Galbo—machinery and tools for new garage on Pine St.

Pa., Mercer—The Star Fdry. & Machine Co., V. Doak, Purch. Agt.—machinery and equipment for foundry and machine shop.

Pa., Phila.—H. Rosenfeld, 431 Fitzwater St.—several 30 in. square shears, (used).

Pa., Pittsburgh—The Acme Stamping & Mfg. Co., 207 Corliss St.—one 3 A Bliss double crank geared press, (used).

Pa., Sharon—F. Messersmith—machinery and equipment for proposed garage in Brookfield.

Wis., Cable—The Cable Auto Co.—equipment for proposed garage on Main St.

Wis., Kaukauna—W. Van Lieshout—equipment for auto repair work.

Wis., Kennosha—Krisor Bros., 772 Milwaukee Ave.—equipment for auto repair shop including 2 ton press.

Wis., Madison—The Madison Gas & Electric Co., 120 East Main St., J. St. John, Mgr.—auto repair equipment for proposed service station and garage on Main St.

Wis., Madison—Wingra Park Garage Co., 1501 Monroe St.—equipment for repair shop including press, compressor, etc.

Wis., Milwaukee—The South End Garage, Kinnicinnic and Fernwood Aves.—medium size drill press for use in garage.

Wis., Racine—J. C. Olsen, Route 3, Box 71—one sheet metal brake, folder rolls, turner, burning machines, beader and ruler.

Ont., Drumbo—J. Harmer—complete equipment for garage and auto repair shop. Estimated cost, $40,000.

Ont., Welland—L. R. Weeks Eng. Co.—rolling machine for seamless steel tubing plant.

Machinery Wanted

Conn., Stafford—The Phoenix Woolen Co., manufacturer of woolens, jersey cloth, etc.—one cloth drying machine, Heathcote Upright preferred.

Ky., Lexington—The Bybee Pottery Co., c/o T. B. McCoun—machinery and equipment for proposed pottery plant.

Mass., Charles River—C. Hall—five-cut "Link & Link" 26 or 28 in. bed space knitting machine; one 6-spindle sheen winder machine; 500 or 600 seven point single thread loopers, (used).

Mich., Detroit—The Gunberg Packing Co., 2380 20th St.—miscellaneous mechanical equipment for the manufacture of sausages, etc.

Minn., Bemidji—The Bemidji Woolen Mills—one napping machine suitable for napping blankets, (used).

Minn., Fergus Falls—The Fergus Falls Woolen Mills Co.—one cloth drying machine, (used).

Minn., Mankato—The Mankato Co-operative Dairy Assn., A. L. Veigel, Mgr.—ice cream machinery, including 15 ton ice machine and some cream vats.

Mo., Joplin—A. Boswell & Co., 628 Main St., manufacturer of face powder, etc., H. Arthur, Purch. Agt.—powder grinders and mixers.

Mo., Joplin—H. Hakon, Frisco Bldg.—lense grinders for power equipment.

Mo., Joplin—The Jones Optical Co., 509 Main St.—lense grinders and polisher for power equipment.

Mo., Joplin—The Keystone Products Co., 10th and Wall Sts., G. G. Delzell, Mgr. and Purch. Agt.—belting and shafting for soap factory.

Mo., Joplin—The Printers Bulletin, 1621 Main St., J. Anderson, Purch. Agt.—linotype, power metal cutting off machine, stenotype machine and casting box for print shop.

Mo., Joplin—A. Stevens, 709 Virginia Ave.—air compressor, belting and shafting.

Mo., Kansas City—C. Thompson, 98th and Holmes Sts.—belting and shafting for creamery.

Mo., St. Louis—The Acme Electric Co., 221 Market St.—Curtis air compressor, with tank and motor.

Mo., St. Louis—The Natl. Lead Co., 722 Chestnut St., W. M. Lowry, Purch. Agt.—one a.c. electric driven mine hoist, rope capacity of 800 ft. of 1¼ in. rope, single laid on drum, capacity 15,000 lb. unbalanced load rope full 22,000 lb.; two 1,500 cu.ft. free air per min. air compressors, 100 lb. pressure, motor or belt drive, a.c. direct connected, preferred; two 2,000 cu.ft. free air per min. air compressor, 100 lb. pressure, motor or belt drive, 140 lb. steam pressure, 1,250-1,500 k.w. a.c. generator, 3 phase, 60 cycle; one low pressure turbine, 140 lb. steam pressure, 1,250-1,500 k.w. a.c. generator, 3 phase, 60 cycle.

N. J., Belleville—The Thompson Machine Co., 298 Main St., W. J. M. Walker, Treas.-Genl. Mgr.—blue-printing machine and steel filing equipment to file drawings, tracings and sketches.

N. Y., Binghamton—The Nailless Heel Co., Court and Milford Sts., O. Cone, Purch. Agt.—special machinery and equipment for the manufacture of shoe heels.

N. Y., Binghamton—L. & S. Battery Mfg. Co., 659 Washington Ave., C. H. Langdon, Purch. Agt.—machinery and equipment for the manufacture of storage cells, charging apparatus and panels.

N. Y., Buffalo—The Buffalo Nipple & Machine Co., 335 Glenwood Ave.—enameling oven.

N. Y., Carthage—R. D. Reichel—printing presses and other machinery requirements for daily newspaper.

N. Y., Chemung—G. Shaw Co.—saw mill machinery and equipment to replace fire loss.

N. Y., Franklin—F. Hoffman—machinery and equipment for making pastry and bread, including pans, mixing troughs and mixer, electric driven.

N. Y., Jamestown—H. R. Ericson, 14 Spring St., Ext.—small or medium size printing press and small engraving machine or machinery.

N. Y., Jamestown—C. F. Carlson, 19 Norwood Ave., Sta. A.—printing press, (new or used).

N. Y., New York—J. W. Sullivan Co., 827 East 9th St.—steam driven 2 stage air compressors with capacity 1,200 cu.ft. per min.

N. Y., Rome—W. E. Allison Co., Washington and Front Sts.—knitting looms and machinery for the manufacture of underwear, etc.

N. Y., Rome—F. C. Spadaforce, 831 East Dominick St.—complete electric driven air compressor and tank for high pressure.

N. Y., Schenectady—The Mary Ann Creek Mining Co., Inc., 469 State St., W. F. Wellman, Purch. Agt.—fine grinding machines, Ball or equal; cyanide oil flotation equipment; rock drills, air compressor and rock handling equipment.

N. Y., Utica—The Utica Independent Laundry Corp., 21 Grant St., B. Abelove, Purch. Agt.—machinery and equipment for modern laundry.

N. Y., Watertown—A. E. Marshall, I. O. O. F. Bldg., Stone St.—machinery and equipment for repairing and charging storage batteries.

N. Y., Watertown—The Shaughnessy Knitting Co., 208 East Moulton St., M. J. Shaughnessy, Purch. Agt.—machinery and equipment for the manufacture of fibre silk underwear.

N. Y., Watertown—P. S. Slate, Otis Bldg.—shafting and transmission equipment and electric motors for board mill at Black River.

N. Y., West Seneca (Buffalo P. O.)—The Triangle Dairy Co., Inc., W. J. Milligan, 236 Triangle St., Buffalo, Purch. Agt.—machinery and equipment for proposed dairy.

N. C., Canton—W. T. Barker—canning machinery and equipment for proposed factory.

N. C., Kinston—R. W. Fowler Co.—cold storage and ice making machinery and equipment.

N. C., Salisbury—The Rowan Creamery Co., W. G. Yeager, Mgr.—butter, creamery and refrigerating machinery and equipment.

N. C., Wilmington—W. C. Smith, P. O. Box 1128—machinery for knitting mill and machinery for sawmill.

O., Cincinnati—The Maxwell & Rothschild, Textile Bldg.—one doubling and folding machine, Windle make preferred, (used).

O., Cleveland—The Industrial Fibre Corp. of America, West 98th and Walworth Sts., W. W. Birge, Pres.—twisting and reeling machines.

O., Cleveland—The Western Novelty Mfg. Co., 1540 East 49th St.—one 12 x 18 or 14 x 22 press and 30 in. paper cutter.

O., Cleveland—The Wilberite Roofing Co., Brook Park Rd., F. S. Wilber, Sales Mgr. —additional machinery for the manufacture of roofing materials.

O., Columbus—The State of Ohio, Dept. of Welfare, Oak and 9th Sts.—steam driven air compressor for Massillon State Hospital, Massillon, estimated cost, $6,000; ice manufacturing machine, 10 ton capacity, for Ohio Sanitarium, Mt. Vernon, estimated cost, $6,500; coal crusher and conveyor for the Cleveland State Hospital Cleveland, estimated cost, $3,500.

Okla., St. Louis—A. S. Partridge—double engine, single drum hoist.

Pa., Bradford—The Bradford Era—fast printing press and other equipment for proposed printing plant.

Pa., Erie—The Odin Stove Mfg. Co.—equipment for stove factory on West 12th St.

Pa., Phila.—The Phila. Brewing Co., Fairhill and Clearfield Sts.—woodworking machinery, steam bending machine for wood, metal working machine and various machines for brewery.

Pa., Phila.—The Superior Knit Wear Corp., 8th and Wallace Sts.—double rolling napping machine 60 in., (used).

Pa., Phila.—H. Swoboda & Sons, Inc., 1027 North Bodine St.—acid vats, conveyor systems, finishing and polishing machinery for leather factory.

Pa., Pittsburgh—The A. S. Davison Co., Oliver Bldg.—one 10 ton, 50 ft. span overhead traveling crane.

Pa., Warren—F. Nichols, Balzinger Blk. —machinery, tools and equipment for modern shoe repair shop.

S. C., Bennettsville—O. R. Brown—machinery to manufacture boxes, barrels, etc.

S. C., Clinton—The Thornwell Orphanage, L. R. Lynn, Pres.—machinery and equipment for laundry.

S. C., Greenwood—M. C. Marshall—complete machinery and equipment for canning factory.

W. Va., Parkersburg—The Seward Wire Co., T. J. Seward, 17 West 42nd St., New York, Mgr.—insulated wire machinery for manufacturing rubber covered electric wire.

Wis., Appleton—The Weber Knitting Mills, 624 Richmond St.—motors, power machinery, knitting and special machinery for proposed knitting mill on Main St.

Wis., Clinton — Terwilliger — gasoline storage tank and pump for garage.

Wis., Eldorado—Dodd School Cheese Factory, Route 1, F. Dodd, Pickett, Purch. Agt. —belt driven machinery and vats for manufacturing cheese.

Wis., Hartford—J. A. Grimm—conveyor for coal hoppers.

Wis., Hartford—A. P. Janzer, Palace Bakery—mechanical baking equipment, steam tank.

Wis., Lake Geneva—The Mann Candy Co., c/o F. Mann, Pres.—motors, refrigerating machinery and special machinery for proposed ice cream plant.

Wis., Madison—The Bd. Normal School Regents, Capitol Bldg., W. J. Kettle, Secy. —blacksmith machinery and machinery for tool repairing at State Normal School, Platteville.

Wis., Milwaukee—J. C. Heisa, 5010 Vliet St.—air compressor complete with motor and tank.

Wis., Milwaukee—H. Nesser, 1257 26th St.—portable power sawing outfit.

Wis., Morgan (Gresham P. O.)—O. E. Morgan—belt driven planing mill machinery.

Wis., Portage—The Market Grocery—mechanical baking equipment, including oven, portable Vulcan or equal.

Wis., Prairie du Chien—The Prairie du Chien Woolen Mill Co., J. W. Paris, Secy.—about 28 looms for woolen mill.

Wis., Pulaski—The Northern Oak Chair Co., c/o F. Poprocki—special woodworking machinery.

Wis., Rosholt—J. Wiza—gasoline storage tank with pump and air compressor.

Wis., Sturgeon Bay—Peterson Bros. Co., c/o G. Peterson—equipment for auto repair work including compressor, one ton press, etc.

Wis., Trippville (Glendale P. O.)—H. Wheeler—complete equipment for blacksmith shop.

Wis., Truesdale—The Truesdale Canning Co., 78 North Main St., E. Mischler, Pres.—canning machinery and conveyors for proposed cannery.

Wis., Waukesha—O. W. Rowlands, Route 9—special machinery for proposed pasteurizing plant.

Wis., Wisconsin Rapids—Hein & Sutor, 142 1st St.—paper cutting machine.

Ont., Niagara Falls—E. Coste & Co., Ltd., has taken leases on a large area in Tilbury West and plan to drill for natural gas—natural gas drilling equipment. Estimated cost, $35,000.

Ont., St. Jacobs—The Snider Flour Milling Co.—modern flour milling equipment.

Ont., Welland—The Empire Cotton Mills, Ltd.—150 automatic looms for weave shed addition.

Ont., Woodstock—A. Hastings & Son, Dundas and Berch Sts.—seven visible oil and gas pumps operated by electric vacuum system.

Man., Winnipeg—The W. A. T. Electrical Mfg. Co., 402 Lotredale Ave.—automatic machine for wrapping celluloid.

Metal Working Shops

Cal., San Francisco—L. R. Lurie, Flatiron Bldg., has had plans prepared for the construction of a 1 story machine shop on Folsom St. near 5th St. Estimated cost, $15,000. S. Heiman, 57 Post St., Archt.

Conn., Waterbury—The Connecticut Light and Power Co., Lakeville St., has had plans prepared for the construction of a 4 story, 60 x 135 ft. garage, etc., on Freight St. Estimated cost, $100,000. L. A. Walsh, 51 Leavenworth St., Archt.

Ill., Chicago—R. F. France, Archt., 155 North Clark St., is receiving bids for the construction of a 1 story, 100 x 200 ft. garage at 2470-78 North Clark St., for K. R. Beak, c/o architect. Estimated cost, $50,000.

Ill., Chicago—Newhouse & Burnham, Archts., 4630 Prairie Ave., are receiving bids for the construction of a 1 and 2 story, 140 x 308 ft. garage on Fair Oaks Ave. and Bway., for E. Bain and L. A. Wolf. Estimated cost, $80,000.

Ill., Chicago—C. D. Paschong, 6445 South Sangamon St., has awarded the contract for the construction of a 1 story, 110 x 150 ft. garage on Calumet Ave. and 63rd St. Estimated cost, $70,000.

Ind., Hammond—Jones & Laughlin Co., Ross St., Pittsburgh, Pa., plans to build a steel plant here. Probably private plans.

Ky., Louisville—The Haury Motor Co., 811 South 3rd St., has awarded the contract for the construction of a 2 story, 60 x 200 ft. garage on 3rd and York Sts. Estimated cost, $75,000. Noted Feb. 9.

Mass., Springfield—The Westinghouse Electric & Mfg. Co., Page Blvd., will build a 1 story, 80 x 520 ft. addition to its plant, for the manufacture of electric specialties. Estimated cost, $100,000.

Mass., Westfield—The Foster Machine Co., South Broad St., is having plans prepared for the construction of a 1 story, 25 x 120 ft. addition to its plant for the manufacture of textile machinery. Estimated cost, $35,000. Private plans.

Minn., Minneapolis—The Amer. Elevator & Warehouse Co., has purchased the plant of the Amer. Malt & Grain Co., on Childs St., here, and plans to build an addition. Estimated cost including equipment $50,000. C. E. Thayer, Pres.

N. H., Manchester—The Commonwealth Last Co., Somerville St., has awarded the contract for the construction of a 2 story, 91 x 160 ft. factory on Maple St., for the manufacture of shoe lasts. Estimated cost, $40,000.

N. J., Trenton—Fitzgibbon Crisp Co., Calhoun and Dunham Sts., has awarded the contract for the construction of a 1 story, 50 x 100 ft. factory for the manufacture of auto bodies. Estimated cost, $10,000.

N. Y., Oswego—The Fitzgibbons Boiler Co., 23 Mercer St., plans extension to plant. Estimated cost, between $40,000 and $50,000.

N. Y., Rochester—W. P. Farley, 1005 Harvard St., plans to build a machine factory on Halstead St. Estimated cost, $8,000. Architect not announced.

N. Y., Salamanca—C. R. Gibson plans to build a 2 story, 45 x 110 ft. garage on Wildwood Ave. Estimated cost, $40,000. Architect not announced.

O., Cleveland—J. Basta, 7001 Union Ave., has awarded the contract for the construction of a 1 story, 50 x 80 ft. garage at 11903 Miles Ave. Estimated cost, $40,000.

O., Cleveland—The Bd. Educ., East 6th St. and Rockwell Ave., will receive bids until May 15 for the construction of a 2 story, 65 x 245 ft. addition to high school on Scranton Rd. and Castle Ave., including manual training and workshop departments. Estimated cost, $400,000.

O., Cleveland—The Vichek Tool Co., 3000 East 87th St., has awarded the contract for the construction of a 1 story, 49 x 82 ft. heat treating plant on East 87th St. Estimated cost, $40,000.

Pa., Erie—Odin Stove Mfg. Co. plans to build a 26 x 122 ft. factory on West 12th St. for the manufacture of stoves. Estimated cost, $10,500. Architect not announced.

Pa., Kane—The E. & O. Mfg. Co., of Fredonia, N. Y., manufacturer of auto signal lamps, plans additions and alterations to former plant of Berry Truck & Body Co. here. Estimated cost between $15,000 and $20,000.

Pa., Koppel—The Koppel Car Repair Co. will build a 1 story, 60 x 500 ft. factory. Noted March 30.

Pa., Phila.—The White Dental Co., 211 South 12th St., has awarded the contract for the construction of a 1 story, 44 x 80 ft. factory on Oakland and Unity Sts. Estimated cost, $11,500.

Wis., Beloit—J. Terwillizer, Clinton, has awarded the contract for the construction of a 2 story, 75 x 135 ft. garage on Broad St. Estimated cost, $45,000. Noted April 27.

Wis., Cable—The Cable Auto Co. has awarded the contract for the construction of a 1 story 50 x 95 ft. garage on Main St. Estimated cost, $45,000.

Wis., Elkhorn—F. Hilton & Co. is having plans prepared for the construction of a 2 story, 42 x 60 ft. factory for the manufacture of band instruments. Estimated cost, $15,000. M. Tullgren & Sons, 425 East Water St., Milwaukee, Archts.

Wis., Kaukauna—W. Van Lieshout has awarded the contract for the construction of a 1 story, 50 x 100 ft. garage. Estimated cost $40,000.

Wis., Kenosha—Krisor Bros., 772 Milwaukee Ave., have awarded the contract for the construction of a 1 story, 60 x 110 ft. garage. Estimated cost, $40,000. Noted April 27.

Wis., Madison—The Madison Gas & Electric Co., 120 East Main St., is having plans prepared for the construction of a 2 story, 60 x 110 ft. service station and garage on Main St. Estimated cost, $45,000. J. St. John, Mgr. Private plans.

Wis., Madison—J. Peterson, 102 South Orchard St., is having plans prepared for the construction of a 1 story, 114 x 117 ft. garage on Monroe St. Estimated cost, $50,000. M. P. Schneider, 401 West Doty St., Archt. Wingra Park Garage Co., 1501 Monroe St., lessee.

Wis., Rosholt—J. Wiza, Polonia, plans to build a 1 and 2 story garage, here. Estimated cost, $40,000. Private plans.

Wis., Sturgeon Bay—Peterson Bros. Co. c/o G. Peterson, has purchased a site and plans to build a 2 story garage and repair shop. Estimated cost, $60,000. Architect not selected.

Ont., Welland—L. R. Weeks Eng. Co. is having plans prepared for the construction of a 1 story, 80 x 400 ft. plant for the manufacture of seamless steel tubing. Estimated cost, $100,000.

General Manufacturing

Cal., Fresno—The Fresno Bee has awarded the contract for the construction of a 3 story newspaper plant on Van Ness and Calaveras Sts. Estimated cost, $100,000.

Cal., San Francisco—O'Brien Bros., Inc., Archts., 240 Montgomery St., are receiving bids for the construction of a 2 story bakery on Howard St. near 4th St., for L. R. Lurie, Flatiron Bldg. Estimated cost, $10,000. Bake-Rite Oven Mfg. Co., Hearst Bldg., lessee.

Cal., Stockton—O. Kern, c/o Davis-Heller-Pearce Co., Delta Bldg., is having plans prepared for the construction of a 2 story, 75 x 100 ft. bakery and apartment building on California and Oak Sts. Estimated cost, $30,000.

Conn., New Britain—E. R. Hitchcock & Co., 303 Main St., has awarded the contract for the construction of a 2 story, 45 x 100 ft. printing plant on Chestnut St. Estimated cost between $35,000 and $40,000.

Conn., New London—The E. Bloom Co., Inc., has awarded the contract for the construction of a 2 story, 56 x 168 ft. addition to its silk factory on Elm St. Estimated cost, $50,000.

Ind., Hammond—The Standard Steel Car Co. has awarded the contract for the construction of a 1 story, 120 x 400 ft. paint shop. Estimated cost, $100,000.

Ky., Lexington—The Bybee Pottery Co., c/o T. B. McCoun, plans to build a pottery plant here. Cost to exceed $5,000. Architect not announced.

Me., Skowhegan—The Maine Spinning Co. has awarded the contract for the construction of a 3 story, 84 x 200 ft. spinning mill Estimated cost, $200,000. Noted March 16.

Mass., Lawrence—The Kress Carriage Co., 106 Concord St., will soon award the contract for the construction of a 2 story, 45 x 95 ft. addition to its carriage factory. Estimated cost, $35,000. Private plans.

Mass., North Dighton—The Mt. Hope Finishing Co. has awarded the contract for the construction of a 1 story 115 x 300 ft. main building; 1 story, 50 x 150 ft. soap house; 1 story, 50 x 150 ft. chemical laboratory; 1 story, 40 x 155 ft. dairy plant and 4 steel storage buildings. Estimated cost, $300,000. Noted April 13.

Mich., Detroit—A. Backus Junior & Sons, 1533 West Lafayette Ave., plans to build a 2 story box factory on Livernois Ave. along the track of the Detroit Terminal Railroad. Estimated cost, $200,000. Architect not selected.

Mich., Detroit—The Gunsberg Packing Co., 2380 20th St., having plans prepared for the construction of a 2 story addition to its sausage factory on 20th St. Estimated cost, $25,000. Kohner & Seeler, 1402 Kresge Bldg., Archts.

Mich., Detroit—H. Scherer, 440 East Jefferson Ave., manufacturers of auto trimmings and upholstering materials, has awarded the contract for the construction of a 10 story, 66 x 140 ft. shops and office building on Woodward Ave. Estimated cost, $75,000.

Mich., Kalamazoo—The City is having plans prepared for the construction of a gas plant. Estimated cost, $2,000,000. Burns & McDonnell, Interstate Bldg., Kansas City, Mo., Engrs.

N. Y., Allegany—The Acme Milling Co., Olean, plans to build a 2 story, 24 x 36 ft. and 1 story 36 x 38 ft. addition to its feed mill, here. Estimated cost, $10,000. Architect not announced.

N. Y., Buffalo—The DuPont Fibre Silk Co. has awarded the contract for the construction of an addition to its silk plant on River Rd. Estimated cost, $2,000.000. Noted April 13.

N. Y., Little Falls—The Barnett Leather Co., 81 Fulton St., New York, has awarded the contract for the construction of a factory, here. Estimated cost, $100,000.

N. Y., Lockport—G. F. Hardy, Engr., 309 Bway., New York City, is receiving bids for the construction of a paper mill here for A. W. Jack Corp. Estimated cost to exceed $100,000.

N. Y., New York—State Hospital Comm., Albany, has awarded the contract for the construction of a bakery building, etc., at the Manhattan State Hospital, Wards Island, here. Estimated cost, $240,000.

O., Barberton—The Silica Sand Co. plans to build a sand plant to replace the one recently destroyed by fire. Estimated cost, $25,000.

O., Cincinnati—Tietig & Lee, Archts., 901 4th Natl. Bank Bldg., will soon receive bids for the construction of a 5 story, 61 x 65 ft. cold storage plant on Cormany St., for the J. and F. Schroth Packing Co., Cormany and Township Sts. Estimated cost, $70,000.

O., Cleveland—The A. & B Box Co., 8628 Woodland Ave., has had plans prepared for the construction of a 1 story, 90 x 183 ft. factory on East 152nd St. Estimated cost, $60,000. H. C. Roberts, Secy. H. M. Morse & Co., Finance Bldg., Archts.

O., Cleveland—The Industrial Fibre Co., West 98th St., near Walford Rd., has had plans prepared for the construction of a 2 story, 41 x 99 ft. factory on West 98th St. Estimated cost, $50,000. J. H. Williams, c/o owner, Archt.

O., Cleveland—Rothkopf Bros., 6112 Central Ave., is having plans prepared for the construction of a 2 story, 40 x 130 ft. dairy at 10712 Superior Ave. Estimated cost, $75,000. A Sogg, 319 Hippodrome Bldg., Archt.

Pa., Erie—The Erie Burial Casket Co., 20th and Peach Sts., is having plans prepared for the construction of a 2 story, 200 x 300 ft. casket factory along the tracks of the Pennsylvania R.R. between 8th and 10th Sts. Estimated cost, $300,000. Private plans.

Pa., Pittsburgh—H. J. Heinz Co. has awarded the contract for the construction of a 6 story, 92 x 150 ft. spaghetti factory. Estimated cost, $250,000.

Pa., Phila.—Powers, Weightman-Rosengarten Co., 916 Parrish St., has awarded the contract for the construction of a 2 story, 42 x 80 ft. chemical plant on 35th and Moore Sts. Estimated cost, $20,000.

Pa., Pittsburgh—The St. Louis Independent Packing Co. has awarded the contract for the construction of a 2 story, 106 x 109 ft. cooler building at 6349 Station St. Estimated cost, $50,000. Noted April 27.

R. I., Olneyville—LePoutre Bros., c/o Lafayette Worsted Mills, Woonsocket, plan to build a large 2 story, spinning mill, here. Architect not announced.

Wis., Appleton—The Weber Knitting Mills, 624 Richmond St., plans to build a 2 and 3 story, 46 x 50 ft. knitting mill on Main St. Estimated cost, $50,000. Architect not announced.

Wis., Hartford—A. P. Janzer, (Palace Bakery), will build a 3 story, 30 x 70 ft. addition to bakery. Estimated cost, $10,000.

Wis., Lake Geneva—The Mann Candy Co., c/o F. Mann, Pres., has awarded the contract for the construction of a 2 story, 50 x 100 ft. ice cream factory. Estimated cost, $55,000.

Wis., Prairie du Chien—The Prairie du Chien Woolen Mill Co. will receive bids until May 20 for the construction of a 2 story, 47 x 187 ft. woolen mill. Estimated cost, $100,000. J. W. Paris, Secy. Parkinson & Dockendorff, Linker Bldg., La-Crosse, Archt.

Wis., Truesdale—The Truesdale Canning Co., 78 North Main St., Kenosha, is having preliminary plans prepared for the construction of a 2 story cannery. Estimated cost, between $50,000 and $60,000. E. Mischler, Pres. G. H. Leipold, 160 Martin St., Milwaukee, Archt.

Wis., Waukesha—O. W. Rowlands, Route 9, is receiving bids for the construction of a 1 story, 40 x 62 ft. pasteurizing plant near here. Estimated cost, $15,000. F. B. Gray, First Natl. Bank Bldg., Aurora, Ill., Archt.

Ont., St. Jacobs—The Snider Flour Milling Co. plans to rebuild flour mill which was partially destroyed by fire. Estimated cost, $100,000.

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American Machinist

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Mr. Mason Britton, Gen.Mgr., Oct. 12, 1921.
"American Machinist",
Tenth Ave. & 36th St.,
New York City, N.Y.

Dear Mr. Britton:-

I have yours of the 4th, telling me that the "American Machinist" will be 44 years old in November.

I believe it is correct to say that this covers the whole period of the development of the machine tool industry as we know it today, and no one will deny that the "Machinist" had a big part in that development.

Always an open forum for the discussion of the best ideas in shop methods and machine tool design, it acquired a subscription list which brought it the recognition as the logical medium through which machine tool manufacturers could most effectively reach the buyers.

Our records show that we began taking space in the "Machinist" more than thirty years ago. Your paper and our Company were both small then, and in a way we have grown up together.

Wishing you continued success in your efforts to build the "American Machinist" into a stronger and better paper from year to year, I am

Yours very truly,

C Wood Walter

CWW-LH Vice. President & Secretary.

American Machinist

Volume 56 NEW YORK, MAY 18, 1922 Number 20

Shall We Standardize Machine Tools?

The Dangers of Promiscuous Standardization—What Real Standardization Means and How a Start Can Be Made—Good Standards Available

BY GEORGE E. MERRYWEATHER
President, Motch & Merryweather Machinery Company

FOR the last fifteen or sixteen years the builders of machine tools have been discussing the merits of standardizing some of the parts of machine tools. Everybody agrees that something ought to be done about it and that it would be a good thing for the industry and for each individual. Then a committee is appointed and the matter is forgotten. So far none of the committees has committed anything more serious than time-slaughter and not much of that, probably because they took a good look at all the things that ought to be done and couldn't decide just where to start.

They had to buck the splendid conservatism of the dollars-and-cents men at the head of the different companies, too. And no wonder there was opposition to standardization, as it was, and still is understood by a good many people. I haven't a doubt that a lot of the machine tool builders thought the standardization scheme was going to be something like the one that was put up to me during the war by one of the younger "experts" of one of the government departments. This fellow blew into my office one day and said he wanted the names of all the companies in the country that made "laths" and "planners." It was a couple of minutes before I gathered what he meant, but when it finally percolated I managed to keep my face straight and ask him what he wanted them for.

"Laths" and "Planners"

Well, it seems he was going to standardize all the "laths" and "planners" so that everybody who made them would produce just one kind and the parts made by one fellow would be interchangeable with those made by every one else. Then we would have real quantity production and lathes would roll out of the shops as the universal cars roll out of Henry Ford's factory. When I asked him if he was going to use the same kind of lathe for turning shells that he used for spinning he seemed a bit disturbed for he evidently thought that a "lath" was a "lath" and that was all there was to it.

Of course this incident is only an example to show how standardization can be reduced to an absurdity, but it does bring out the danger in putting standards work in any but the most expert hands.

Another impression that must be overcome is that the adoption of a standard means that everything which does not conform to the standard must immediately be scrapped. Of course this isn't so. Take the experience of the Society of Automotive Engineers. They have probably done more work along these lines than anybody else and established more standards. I think I am right in saying that not a single one of their standards was actually used in the first year after its adoption by the society.

Manufacturers cannot afford as a rule, to scrap parts or machines already in production because they do not conform to some particular standard. But when changes in design are made, as they must be periodically in order to keep up with the procession, it is easier to make use of an existing standard than it is to take the trouble to design something different. In the course of time everybody has to make changes and before long they all wonder how they ever got along when every designer had a slightly different way of making the same piece.

One Way Instead of Forty-Seven Varieties

As far as the machine tool builders are concerned there are two ways to go at the standardization question, or perhaps it would sit easier if we said "simplification" for that is what it amounts to in the long run. In the first place there are many parts of any machine tool which might just as well be made in just one way instead of forty-seven different ways, differing from each other in non-essential particulars only. The individuality of the designer or of the machine could still find plenty of places and ways to express itself.

Take T-slots, we might just as well decide on enough standard sizes and proportions to take care of any possible requirement and then use them the next time we bring out a new model. The same thing might be done with spindle noses and handles and other inconsequential parts that are more or less alike anyhow. Something could certainly be done about tapers.

Even in these simple things there is room for lots of argument so perhaps it might be better to start out along the other track. There are any number of perfectly good standards already in existence and in common use. There are undoubtedly some of the S. A. E. and A. S. T. M. standards that could be adopted bodily without much effort on the part of anybody. There are ball-bearing standards and specifications for steels and alloys and bearing metals that could be used just as well in machine tools as in automobiles. The National Screw Thread Commission has some excellent recommendations on fits and tolerances in threads and the American Gear Manufacturers' Association is making strides with gears. Getting proved and workable standards in this way would be just as easy as collecting a ready-made family by visiting the orphan asylums and adopting good-looking orphans with satisfactory pedigrees.

As I said before, persuading the industry to accept any kind of a standard isn't going to be an easy job. It

is not so many years ago that one of our most progressive makers of milling machines called me several particularized kinds of a fool for telling him that he would use hardened steel gears and other parts in his machine before he got much further. He's advertising them now.

What is to be gained by standardizing, or simplifying? Well, here's one instance: I know of a company that makes machines for cutting gears. They naturally use gears in their machines and they have been cutting the gears in their own shop on their own machines. Some idiot asked them not so long ago if they could buy their gears cheaper than they could make them as they were making them in relatively small lots. He was laughed out of the office but he made an impression, for they were curious enough to inquire of one of the big gear shops what their gears would cost. To make a long story short, they found that they could buy these gears, cut on their own machines in the gear shop, at about half what they could make them for in their own shop. Is it necessary to go any further?

Now, let me repeat what I said in the beginning. What is needed is a committee that will commit something definite. It should be made up of some men with vision who can grasp the possibilities of simplification and also some of the old reliable hard heads who will keep the visionaries from attempting too much at first and at the same time insist on pushing through the standards that are found to be feasible and worth while.

Rewards for Suggestions—Discussion

By Oscar E. Perrigo

On page 448, Vol. 55, of American Machinist, C. J. Morrison makes some timely and very practical remarks on the subject of "Rewards for Suggestions." His ideas are perfectly correct, in that it requires a very wise management to formulate an equitable system for the examination of and the reward for suggestions, so as always to be fair to the suggestor as well as to the management.

There are a number of good and practical reasons for this condition. Suggestions thoughtfully and honestly made, with a view to the improvement of some general or special condition existing in the plant, or in some of its equipment, are sometimes of no possible value in any form. Sometimes a slight change in the suggestion may render it of considerable value. Again, the germ of thought contained in a suggestion may, when properly developed, form the basis of a good and valuable patent.

The person making the suggestion should always be allowed to be present when his suggestion is to be acted upon, and frequently a few words from him will dissipate a misunderstanding. Besides, we should not forget that: "Every American citizen has the undoubted right to be heard in any cause in which he has a personal interest." Yet many of these cases are decided on ex-parte testimony. That is a reason why men sometimes feel "sore," and think that they have been denied their rights. It is an old shop maxim that "there is no profit in a sore man."

The method of judging the value of suggestions, and of making the payments is a much more important matter than is generally considered. Since some suggestions which seem valuable and are paid for as such are finally found to be useless, while others are paid a nominal sum and afterwards found to be very valuable, suggests a system which will be equitable to all concerned.

The plan is this: Instruct a committee to be liberal in its judgment of the value of suggestions. If there is a doubt as to the practicability and value of a suggestion, give it the benefit of the doubt. Then pay a nominal reward for all suggestions passed upon as favorable. At the end of six months, if no additional value seems to have accrued upon a certain suggestion, let it lay for another six months. If no special value is seen at that time, it is dropped and no further account is kept of it. But, if at the end of six months the suggestion has proved of value, repeat the original payment; and if similar advantage is seen at the end of another six months, repeat the payment again. If, at the end of the second six months, the suggestion has proved of especial value, a final payment of its real worth to the plant is estimated and paid.

The first important feature of this plan is that suggestions of special merit will receive special reward; while, secondly, employees are much more likely to present suggestions for permanent or continued benefit rather than those of temporary or transient value. The aggregate amount which the management feels should be devoted to this purpose can be so divided that the annual expense will be no more than by the usual method, while the good influence which the system exerts among the employees will be greatly enhanced.

Accepting Suggestions

As an illustration of how easy it is to make mistakes in judgment as to the value of suggestions, the following incidents well known to the writer are given. Quite a number of years ago a draftsman was employed to design a certain precision machine, the requirements for which were very rigid. The machine was designed in somewhat less time than the management had expected, and was built under the direction of the designer. Upon the first test it was apparent that changes in the material of some of the parts would be advisable. These changes were made, and upon the final test before the management, the machine was pronounced a success, and several others were ordered to be built. Within a week the designer was made superintendent of the plant.

A number of years after, this same man was employed in a plant where an elaborate suggestion system was in force, and a committee of supposedly technical experts had been appointed to examine the suggestions presented. A certain machine built by the company required as a part of its design a device producing a similar effect to that on the machine which the man had designed years before, so that he now filed a suggestion covering a sketch of the necessary parts. It was examined by the committee, which declared that the principle was wrong and that such a device would be inoperative.

A rather ludicrous sequel to the matter was that a year or so after the above event, this same company purchased a very high-priced and elaborate precision machine in which the very principle that had been rejected was used upon one of its most important precision parts, and was working precisely as it had worked on the machine which had earned this designer a superintendent's position. These happenings naturally lead to the conclusion that it is a man very certain of his ground who undertakes to say that a certain device will not work, lest some man who does not know nearly as much as he should make it work. The time-honored question of "who shall decide when doctors disagree," is not confined to the medical profession.

Methods of Machine Tool Design

Third Article—Machine Tool Drives Analyzed—Why the Drive Problem Is More Difficult for Machine Tools than for Other Machines

BY A. L. DELEEUW

THE drives of many classes of machines consist merely of the simplest kind of power transmission, such as two pulleys and a belt or a couple of sprockets and a chain. As a rule only one speed is required and in the majority of cases the maximum load is well known. Conditions are entirely different with most machine tools. The maximum load is not definitely known and is only guessed at. Very frequently a number of speeds are required and the range of these speeds is much in excess of the range of variable speeds found in any other class of machines. In addition, these speeds must be readily obtained by the operator if they shall be of any use at all.

In fact, there is no other class of machines which combines all of these requirements. A spinning machine does require variable speeds, but over a very small range and requiring little power. An automobile also requires variable speeds, but again over a very limited range and only very few speeds. A machine tool, on the other hand, may require anything between 100 hp. or a fraction of 1 hp. and many machine tools are constructed with as many as thirty, and sometimes even more speeds, all mechanically controlled. It is perfectly true that, as a rule, the user of the machine tool does not require all the speeds furnished, but as the maker of the machine cannot know which speeds might be required by the various users, he is compelled to furnish all useful speeds and bring them close enough together so that whatever the job may be there will always be some speed which is nearly correct for that particular case.

SELECTING SPEEDS

If we had a large boring mill to be used exclusively for the turning and boring of large flywheels, we would require a number of speeds which would make this machine as economical as possible for the turning and facing of the rim and then a few other speeds which would make it as economical as possible for the boring and facing of the hub. For instance, we might have speeds of 1—1.1—1.2—up to 2 r.p.m. for the rim; and 10—11—12—up to 20 r.p.m. for the hub, and this would be perhaps the best arrangement possible if nothing else ever had to be turned up on this boring mill but large flywheels. If a concern should build a special machine for this purpose it would probably arrange the speeds in some such fashion; but in doing so it would make of the machine a special machine in every sense of the word. It would have to be rearranged as soon as different kinds of work were assigned to it. The builder of standard or commercial machine tools is confronted with the problem of selecting speeds which will make the machine as economical as it is possible to make it for any job within its range.

In practically all cases the various speeds of a machine tool are arranged in geometrical progression. It was quite customary to advertise this feature as a special merit of some machine, and even now we may find occasionally an advertisement mentioning the geometrical progression as a special feature of high value and peculiar to the advertised machine; but this only occurs nowadays when the advertiser honestly believes the public to be as ignorant as he himself. We realize at the present time that the geometrical progression of the speeds of a machine tool is the best all-around *compromise.* We know full well that it does not give us the exact speeds we desire, but that no other standardized arrangement would bring us so near to the speed we need under all conditions of size and material of work.

To illustrate this a little further let us take for example a 24-in. lathe made by a well-known machine tool builder. The speeds are twelve in number and range from 8.1 to 315. These speeds, being in geometrical progression, would be 8.10—11.30—15.76—22.00—30.7—42.8—59.6—83.2—116.0—161.8—226—315.

This lathe swings 19¾ in. over the carriage, so that if we have a piece in the machine of a diameter equal to the full swing over carriage, and we should run 8.1 r.p.m., we would have a cutting speed of only 42 ft. Now, there are very few occasions indeed where a piece of the full swing of the lathe and at the same time of a very hard material would have to be turned up, so that we may say that the lower speeds of this lathe are emergency speeds and it would perhaps be perfectly satisfactory if only one of these low speeds were provided. However, the various series or groups of speeds are obtained by the shifting of a pair of gears or the throwing in of a clutch, so that the general nature of a group is reproduced but at a higher speed.

If in this particular case we should leave out the second and third speed so that the first speed would be 8.1 and the second 22, then if we should shift so as to get the next series of speeds beginning with, say, 59.6, the second speed of that series would be 161.8. Now these speeds of 59.6, etc., are used on the great majority of the work done on this machine and it would not be permissible at all to have as great a gap between the speeds as that of 59.6 and 161.8. The necessity of having speeds fairly close together in the higher ranges compels us to bring them fairly close together in the lower ranges also, though we may not need them there. In some other machine we may need the lower speeds close together and this would compel us to furnish a number of high speeds also, though we can get along without them.

CALCULATIONS FOR GEOMETRIC PROGRESSIONS

The following calculations in regard to the speeds of a machine tool also apply to the feeds. In general, they apply to any mechanism in which we wish to have a series of speeds in geometrical progression.

The various drives of machine tools can be divided into two classes. In the first class the first driving element of the machine has a constant speed. In the second class it has an adjustable speed. Machines of the first class are generally called "constant speed" or "single pulley" machines. All the speed changes are

For the author's forthcoming book.

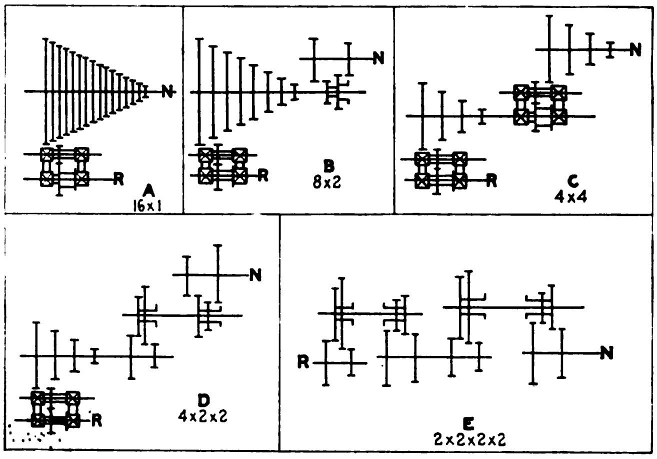


FIG. 16. DIAGRAMS OF 16-SPEED SHIFTS

made by means of the mechanism of the machine itself. In the second class part of the changes, and sometimes all, are made by mechanism of which part is outside of the machine proper, such as a countershaft with cone pulley, or a variable speed countershaft, or an adjustable speed motor.

For the present we will confine ourselves to speeds arranged in geometrical progression. If all speeds are obtained by means of one single system of machine elements, such as, for instance, a number of steps on a cone pulley or a number of gears all served by one tumbler gear, we will say that we have a single shift arrangement. If such a shift is exhausted and we bring into play some other group of elements we will get a two-shift arrangement, etc. The number of shifts possible depends on the number of factors of the numeral indicating the number of speeds. For intsance, with sixteen speeds we would reason thus: We can consider sixteen as 16 x 1, or as 8 x 2, or as 4 x 2 x 2, or as 4 x 4, or as 2 x 2 x 2 x 2. The first would correspond to a cone pulley with sixteen steps (which, by the way, is not likely to be used). In the second arrangement we would have two factors and therefore two shifts; in the third arrangement, 4 x 2 x 2, we have three factors and therefore three shifts, while in the fourth arrangement, 4 x 4, we again have two shifts, and in the last arrangement, 2 x 2 x 2 x 2, we have four shifts.

With eighteen speeds we would have the following: 18, or 2 x 9, or 3 x 6, or 2 x 3 x 3, which will give us respectively 1—2—2—3 shifts. With twenty speeds we would have 20, or 2 x 10, or 4 x 5, or 2 x 2 x 5, which would give us in the same order 1—2—2—3 shifts.

Such arrangements are shown in Fig. 16 in diagrammatic form. Each arrangement consists of as many speed variators as there are shifts, and each individual speed variator is represented as a cone of gears with the well-known tumbler gear and idler, or sometimes as a set of sliding gears.

In Fig. 16-A-B-C-D and E are given the various possible shifts for sixteen speeds. Fig. 16-A shows a cone of sixteen gears or a cone pulley with sixteen steps or maybe sixteen steps of an adjustable speed motor. Fig. 16-B shows a combination of two speed variators, one with eight and one with two steps. Fig. 16-C also has two shifts. This time each one for a speed variator of four steps. Fig. 16-D shows three shifts, one for a speed variator of four steps and two for speed variators of two steps each. Finally, Fig. 16-E shows a four shift variator, each of the two elements being a two step variator. Fig. 17 shows the possible combinations for eighteen speeds and Fig. 18 for twenty speeds.

It should be thoroughly understood that the diagrams do not show the construction of speed changing mechanisms, but merely the way they can be split up into their elements. They do not even show the proper order of these elements; for instance, in Fig. 17-H the six step variator comes first and the three step afterward. This order may be reversed. Which one would be the best sequence would depend on circumstances.

We have shown these various arrangements as all-gear drives, because it simplifies the diagrams. However, some of the groups or variators shown might be adjustable speed motors or belt constructions. There are many arrangements in existence in which the first group or speed variator is replaced by an adjustable speed motor, but, whenever such a motor is used, it will be found as the beginning of the arrangement. One

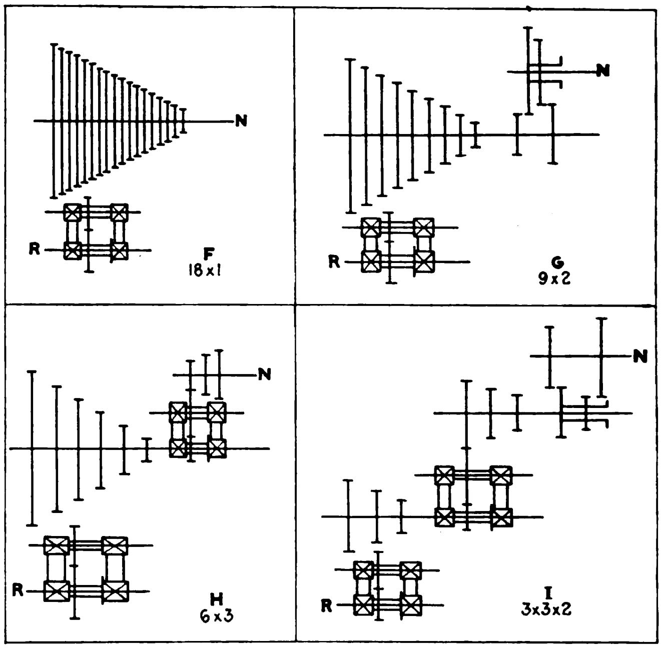


FIG. 17. DIAGRAMS OF 18-SPEED SHIFTS

does not find it as a substitute for the second, third or fourth group. On the other hand, belt drives lend themselves to many variations and groupings.

In Fig. 19 a partial schedule is given of the possible arrangements of machine tool drives. They are divided into two groups, one for constant speed motor or pulley and one in which adjustable speed motors or cone pulleys are used. As we are not really concerned with the adjustable speed motor the diagram proceeds without regard for this element, considering only various belt drives. No effort is made to show the various kinds of constant speed drives because they have been considered in the previous paragraphs. The belt drives are again divided into two groups, in one of which all variations of speeds are made by belt while the other makes its variations by means of belts and gears. This diagram does not show all the possible combinations of belts and gears because they are unlimited in number. It does show, however, a number of the most common constructions used in machine tool drives.

When there are two countershaft speeds they may be arranged either so that a shift from one countershaft speed to the other splits up the variation between two adjoining cone speeds, or else they may be arranged

in such a way that after all the cone speeds are exhausted one makes a shift to the next countershaft speed and begins again with the first cone step.

A few of the arrangements of the above diagram have been further analyzed. They are marked as Case 1-A, Case 1-B, Case 2, 3, 4 and 5. The numerals refer to corresponding numerals in Fig. 19. Cases 1-A and 1-B differ only in so far that in Case 1-A the two cones are supposed to have the same steps as is customary in most machine constructions; while in Case 1-B these cones are not alike. This latter case is not very common. However, it is used where the machine must have speeds very much in excess of the countershaft speeds. The countershaft being a machine unit which depends for its alignment on ceilings and beams and such like is not very well adapted to be run at a very high speed; so that it is advisable to do some speeding up between countershaft and machine, if the machine must run at a high speed. In such cases we will find the countershaft cone different from the machine cone.

The following calculations show a method of obtaining the main elements of the various arrangements indicated in Fig. 19. As all of it may not be quite clear in the mind of the reader at the first reading, we will go over one example, Case 1-A. The number of speeds is given as n, the low speed as s, and the high speed as S. As these speeds are supposed to be in geometrical progression they are:

a——ar——ar^2——ar^3——————————ar^{n-1}.

The range R is the highest speed divided by the lowest which is $\frac{S}{s}$; so that $\frac{S}{s} = r^{n-1}$ and $r = \sqrt[n-1]{\frac{S}{s}} = \sqrt[n-1]{R}$.

The countershaft speed C can be expressed as the largest step of the lower cone divided by the smallest step of the upper cone times the low speed; and we might also express it as the smallest step of the lower cone divided by the largest step of the upper cone times the high speed. This shows us that the countershaft speed equals the square root of the product of high and low speeds.

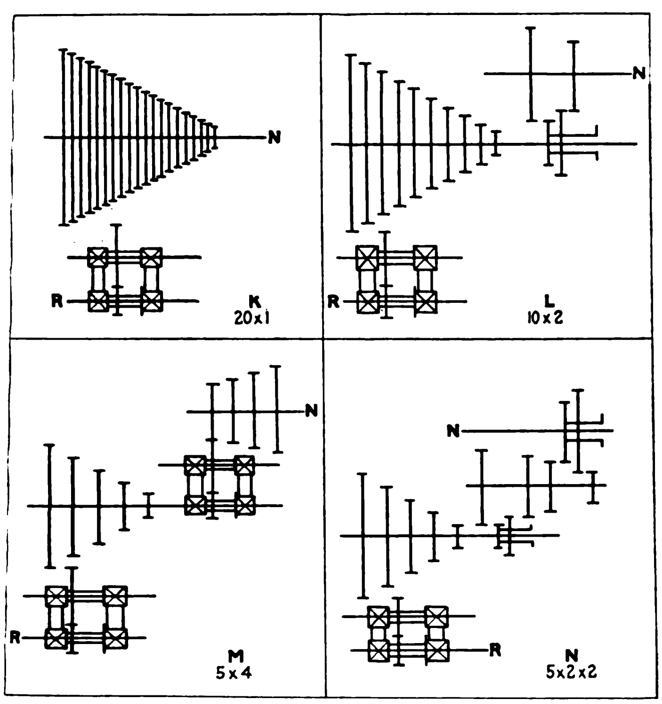


FIG. 18. DIAGRAMS OF 20-SPEED SHIFTS

The accompanying calculation shows so clearly how to find one extreme step of the cone when the other one is given that it is not necessary to go further into this matter. What is not so plain is how to find the next step. In the accompanying calculation the next steps to be calculated are called x and y, and the sum of x and y is supposed to be the same as the sum of d and D which, as we know, is customary. We find, therefore, that step y equals d plus D minus x. Keeping this in mind it will be easy to follow the rest of the calculations.

CASE 1-A

WHEN THE TWO CONES ARE ALIKE

No. of speeds $= n$

Low speed $= s$

High speed $= S$

Range $= R = S \div s$

Ratio of two adjoining speeds $= r = \sqrt[n-1]{R}$

$$\text{Countershaft speed} = C = \frac{D}{d} \times s = \frac{d}{D} \times S$$

$$\frac{D^2}{d^2} = \frac{S}{s}$$

$$\frac{D}{d} = \sqrt{\frac{S}{s}}$$

$$C = \sqrt{\frac{S}{s}} \times s = \sqrt{Ss}$$

If small step $= d$ diameter

$$\text{Large step} = D = d\sqrt{\frac{S}{s}}$$

$$\text{Step } y = D + d - x$$

$$C \times \frac{D + d - x}{x} = s \times r$$

$$\sqrt{Ss} \times \frac{D + d - x}{x} = s \times r$$

$$\frac{D + d - x}{x} = \frac{sr}{\sqrt{Ss}} = \frac{r\sqrt{Ss}}{S}$$

$$D + d - x = \frac{r\sqrt{Ss}}{S} \times x$$

$$D + d = x\left(\frac{r\sqrt{Ss}}{S} + 1\right)$$

$$x = \frac{D + d}{\frac{r\sqrt{Ss}}{S} + 1}$$

$$y = D + d - x$$

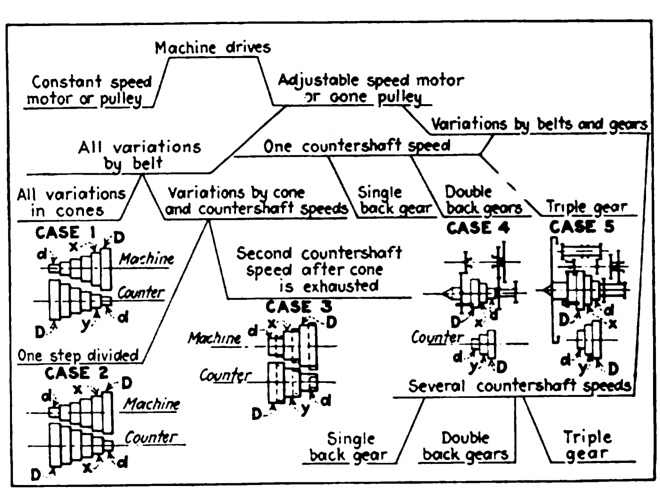


FIG. 19. SCHEDULE OF POSSIBLE DRIVE ARRANGEMENTS

CASE 1-B

WHEN THE TWO CONES ARE NOT ALIKE

No. of speeds $= n$

Low speed $= s$

High speed $= S$

Range $= R = S \div s$

Ratio of two adjoining speeds $= r = \sqrt[n-1]{R}$

Countershaft speed $= C = \frac{D}{d} \times s$

$$\text{Step } y = D + d - x$$

$$C \times \frac{D + d - x}{x} = s \times r$$

$$\frac{D}{d} \times s \times \frac{D + d - x}{x} = s \times r$$

$$\frac{D}{d} \times \frac{D + d - x}{x} = r$$

$$\frac{D^2 + Dd - Dx}{dx} = r$$

$$D^2 + Dd - Dx = rdx$$

$$D^2 + Dd = (rd + D)x$$

$$x = \frac{D^2 + Dd}{rd + D} = \frac{D(D + d)}{rd + D}$$

$$y = D + d - x$$

CASE 2

WHEN THE TWO CONES ARE ALIKE

No. of speeds $= n$

Low speed $= s$

High speed $= S$

Range $= R = S \div s$

Ratio of two countershaft speeds $= r = \sqrt[n-1]{R}$

Ratio of two adjoining pulley speeds $= r^2 = \sqrt[n-1]{R^2}$

Fast countershaft speed $= C_F = \frac{D}{d} \times rs = \frac{d}{D} \times S$

$$\frac{D^2}{d^2} = \frac{S}{rs} \qquad \frac{D}{d} = \sqrt{\frac{S}{rs}}$$

$$C_F = \frac{D}{d} \times rs = rs\sqrt{\frac{S}{rs}} = \sqrt{rSs}$$

$$C_S = \frac{\sqrt{rSs}}{r} = \sqrt{\frac{Ss}{r}}$$

If small step $= d$ diameter

Large step $= D$, $\frac{D}{d} = \sqrt{\frac{S}{rs}}$. $D = d\sqrt{\frac{S}{rs}}$

Step $y = D + d - x$

Third speed is obtained with belt on x and y and with slow countershaft speed.

$$sr^2 = \frac{y}{x} \times C_S = \frac{D + d - x}{x} \times \sqrt{\frac{Ss}{r}}$$

$$sr^2 \times x = (D + d - x)\sqrt{\frac{Ss}{r}}$$

$$sr^2 x + x\sqrt{\frac{Ss}{r}} = (D + d)\sqrt{\frac{Ss}{r}}$$

$$x = \frac{(D + d)\sqrt{\frac{Ss}{r}}}{1 + \sqrt{\frac{Ss}{r}}} = \frac{(D + d)\sqrt{rSs}}{r + \sqrt{rSs}} = \frac{(D + d)C_F}{r + C_F}$$

$$y = D + d - x$$

CASE 3

WHEN THE TWO CONES ARE ALIKE

No. of speeds $= n$

Low speed $= s$

High speed $= S$

Range $= R = S \div s$

Ratio of two adjoining speeds $= r = \sqrt[n-1]{R}$

Slow countershaft speed $= C_S$

Slow countershaft speed brings speed up to step $\frac{n}{2}$

Fastest speed of machine cone, using slow countershaft is $s \times r^{\frac{n}{2} - 1}$

$$C_s = \frac{D}{d} \times s = \frac{d}{D} \times sr^{\frac{n}{2} - 1}$$

$$\frac{D^2}{d^2} = r^{\frac{n}{2} - 1}$$

$$\frac{D}{d} = \sqrt{r^{\frac{n}{2} - 1}} = r^{\frac{n-2}{4}}$$

$C_s = s \times r^{\frac{n-2}{4}}$

To find x and y follow Case 1-A, substituting $s \times r^{\frac{n-2}{2}}$ for S (as this speed is the highest obtainable speed with this countershaft speed)

Fast countershaft speed $= C_F$

$$C_F = C_S \times r^{\frac{n}{2}} = s \times r^{\frac{n-2}{4}} \times r^{\frac{n}{2}} = s \times r^{\frac{3n-2}{4}}$$

CASE 4

ONE COUNTERSHAFT SPEED, DOUBLE BACK GEARS

No. of speeds $= n$

n must necessarily be divisible by 3

Low speed $= s$

High speed $= S$

Range $= R = S \div s$

Ratio of two adjoining speeds $= r = \sqrt[n-1]{R}$

Cone steps bring speeds from high to $\frac{2n}{3}$ speed

Fast back gear brings speed from $(\frac{2n}{3} - 1)$ to $\frac{n}{3}$ speed

Slow back gear brings speed from $(\frac{n}{3} - 1)$ to slow speed

Slowest speed of machine cone without using gears is $s \times r^{\frac{2n}{3}}$

$$C = \frac{d}{D} \times S = \frac{d}{D} \times sr^{n-1} = \frac{D}{d} \times s \times r^{\frac{2n}{3}}$$

$$\frac{D^2}{d^2} = \frac{sr^{n-1}}{sr^{\frac{2n}{3}}} = r^{\frac{n-3}{3}}$$

$$\frac{D}{d} = r^{\frac{n-3}{6}}$$

$$C = \frac{D}{d} \times s \times r^{\frac{2n}{3}} = r^{\frac{n-3}{6}} \times s \times r^{\frac{2n}{3}} = sr^{\frac{5n-3}{6}}$$

To find x and y follow Case 1-A substituting $s \times r^{\frac{2n}{3}}$ for s (as this is the slowest speed obtainable by direct drive).

Ratio of machine cone and shaft driven by fast back gears $= r^{\frac{n}{3}}$

Ratio of fast and slow back gears $= r^{\frac{n}{3}}$

CASE 5

ONE COUNTERSHAFT SPEED, DOUBLE BACK GEARS AND TRIPLE GEAR

No. of speeds $= n$

High speed $= S$

Low speed $= s$

Range $= R = S \div s$

Ratio of two adjoining speeds $= r = \sqrt[n-1]{R}$

Ratio of triple and back gear $= r^{\frac{n}{5}}$

Ratio of back gears $= r^{\frac{n}{5}}$

Ratio of shaft driven by fast back gear and machine cone $= r^{\frac{n}{5}}$

Countershaft speed $= C = sr^{\frac{9n-5}{10}}$

If small step $= d$ diameter

Large step $D = \frac{Sd}{C}$

Step $y = D + d - x$

$$C \times \frac{D + d - x}{x} = \frac{S}{r}$$

$$\frac{D + d - x}{x} = \frac{S}{Cr}$$

$$D + d = x\left(\frac{S}{Cr} + 1\right)$$

$$\therefore x = \frac{D + d}{\frac{S}{Cr} + 1}$$

$$y = D + d - x$$

Reo Connecting Rod Methods

A Double Milling Fixture—Babbitt Expanded in Holes by Rolling—A Neat and Accurate Gage for Inspecting Squareness of Bores

By FRED H. COLVIN
Editor, AMERICAN MACHINIST

THE milling fixture used in the first operation is of different design than that usually employed for this work. It consists of a substantial framework built to contain two rods in a revolving fixture, so that one end is free for unloading and reloading while the cutters are at work on the other end.

The rod rests in the lower V's *A* and *B*, Fig. 1. The small end, however, is supported by an additional block which takes the thrust of the clamping finger *C*. Finger *D* centers and clamps the large end of the rod, both clamps being operated by a handwheel and screw above. A single screw holds both ends of the rod through an equalizing clamp.

Drilling the Large Hole

The large hole is drilled in the fixture shown at the right in Fig. 2. The rod is lightly held, the forged opening centering the drill and the pin *A* preventing the rod from turning under the cut. In drilling the small end, the large bore is used for locating and squaring the rod, as shown at the left at *B*. The quick-acting clamp *C* is a bit unusual, the handle *D* unlatching the locking block and allowing the rod to be swung out of the way after drilling.

After splitting the cap from the rod itself (the bolt holes being previously drilled and tapped), the studs are put in place and the cap assembled to the rod. It is then washed, tinned and babbitted as shown in Fig. 3. The rod slips over a babbitting mandrel which has strips to represent the shims, as at *A*. The cap is held

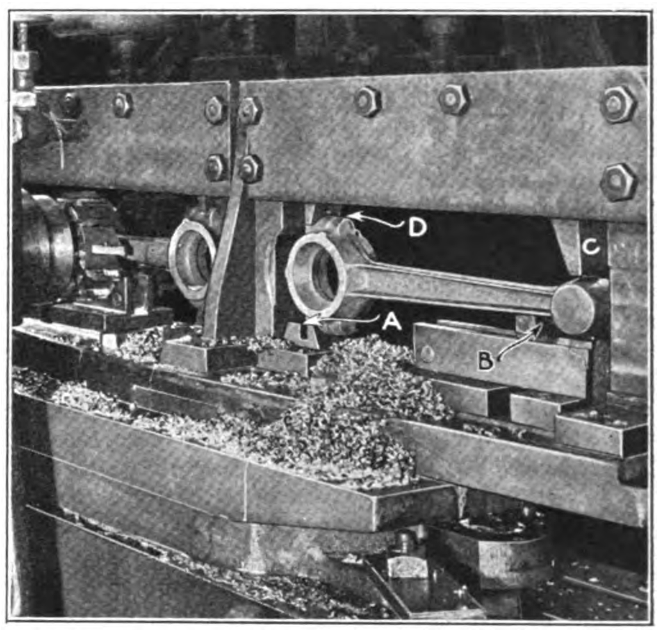


FIG. 1. MILLING SIDES OF CONNECTING RODS

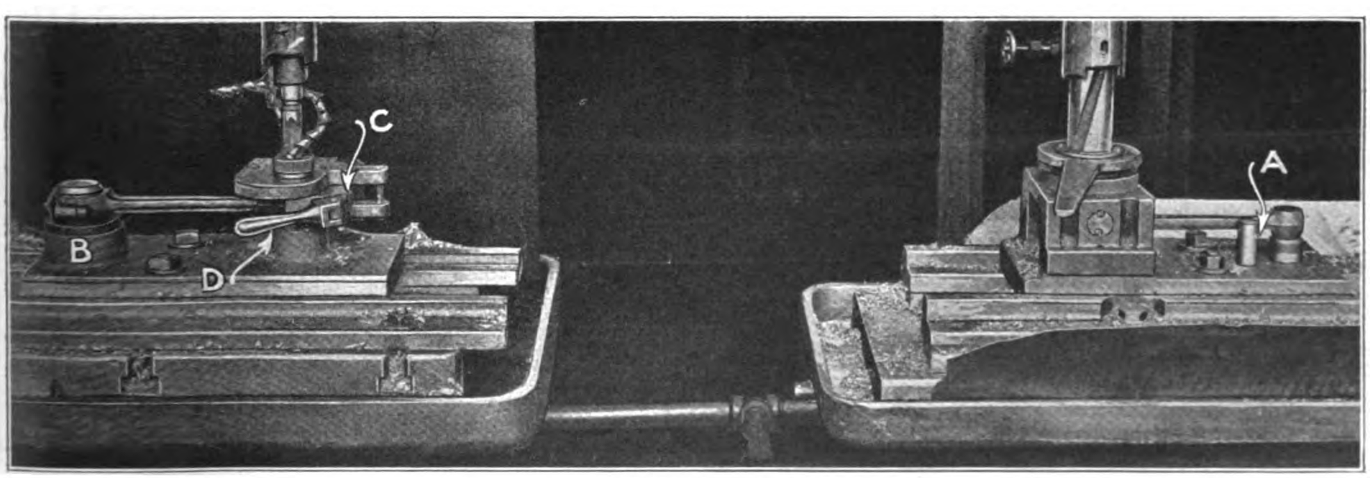
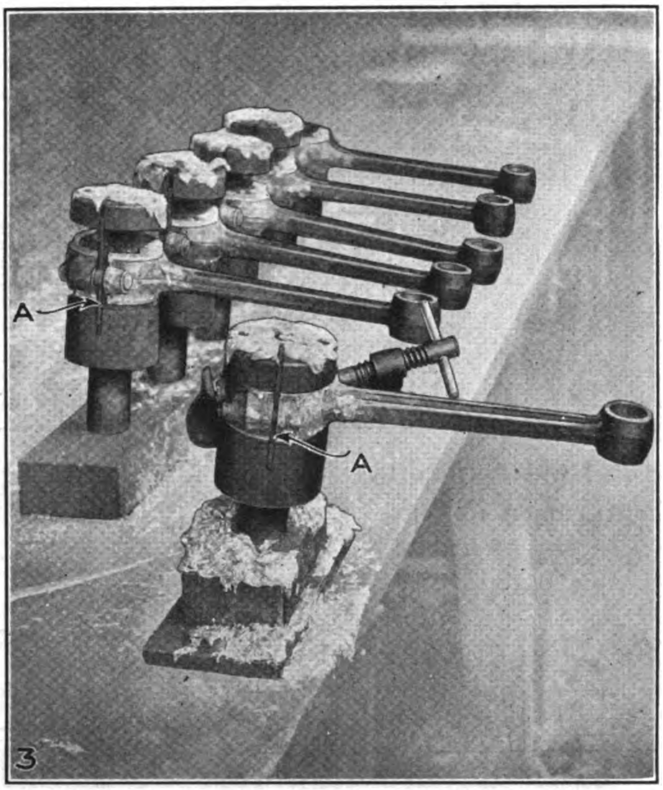


FIG. 2. DRILLING BOTH ENDS OF ROD



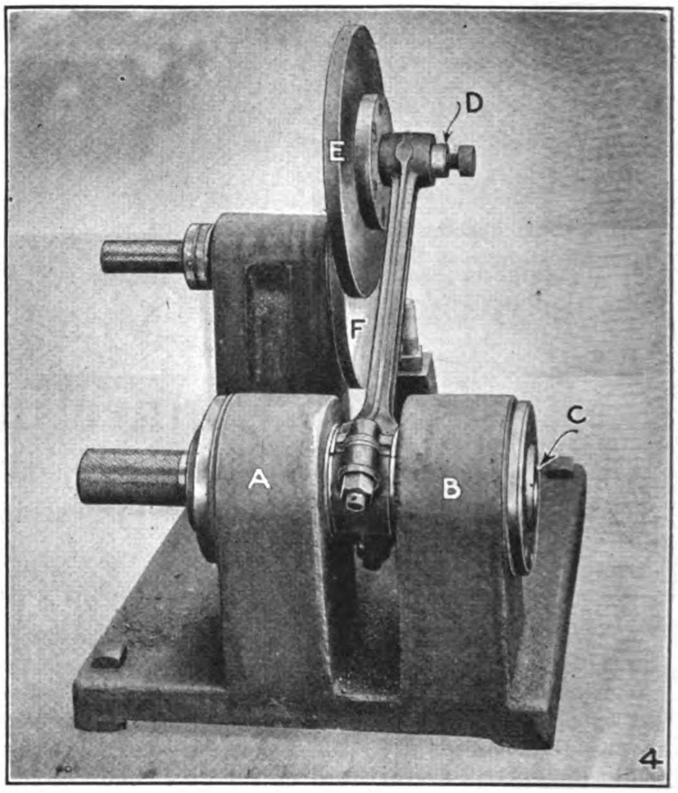


FIG. 3. BABBITTING THE RODS. FIG. 4. TESTING FOR SQUARENESS OF HOLES

in position by the clamp shown while the babbitt is poured.

The oil groove is next cut, the babbitt faced and rough reamed, and then spun with a rolling tool to compress the metal before the final reaming.

In Fig. 4 is shown the test for squareness of the two holes. The large end of the rod is placed between the heavy uprights *A* and *B*, and the plug *C*, representing the crankpin, is pushed in place. The stud *D* on the disk *E* is placed in the piston-pin hole and the rod is then swung so as to bring the disks *E* and *F* in contact. The large size of these disks makes it easy to detect very slight errors in squareness, and it is these errors which have much to do with causing undue wear and producing unsatisfactory motors.

In the final operations the oil dip on the end of the rod is formed, the oil hole carefully cleaned out, the rod buffed and weighed and sent to the assembling department to be fitted to the crankshaft as in Fig. 5.

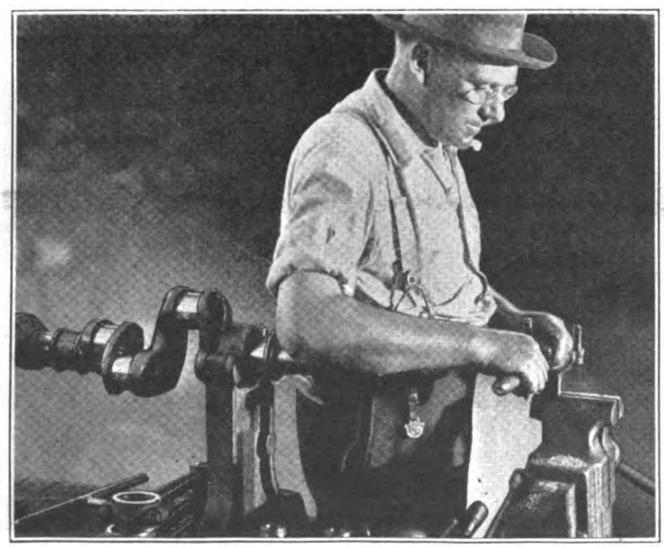


FIG. 5. FITTING RODS TO CRANKSHAFT

Chamber Urges Political Emancipation of Federal Reserve System

A statement issued recently by the finance department of the Chamber of Commerce of the United States urges protection of the Federal Reserve System from politics. The chamber's finance department emphasizes the fact that current uninformed criticism and misrepresentation may threaten the welfare of the system. Efforts that are being made to control the system's discount rates and to alter the composition of the Federal Reserve Board are not in accordance with sound principles, declares the chamber. It is not suggested that sincere and constructive criticism should be discouraged, but that for the moment it should be put to one side in order to confront what is believed to be dangerous tendencies that, unchecked, will promote a gradual ascendancy of political influence in affairs of the system, and contrary to the interests of all the people, undermine the independence of its administration.

The chamber's committee on banking and currency stated some time ago that in dignity the Federal Reserve Board should rank with the Supreme Court and should be equally free from any suspicion of political control. The department adds the opinion that the entire system should be kept non-partisan in character, free from the suspicion of the taint of politics, and should be protected from any efforts to manipulate it in the interests of any class or party, with consequent loss of public confidence in its integrity.

Some forty bills, proposing to amend the Federal Reserve Act, a few constructive but most of them unwise, have been introduced in the present Congress.

Factory Storekeeping and Material Control

The Second Article—Material Routine Personnel—Duties and Qualifications—Who Is Responsible for Quality, Quantity, Time and Cost—Location of Offices

BY HENRY H. FARQUHAR

THE personnel concerned with material handling must necessarily differ both in quantity and quality, as well as in organization, with the particular factory dealt with. In any strictly regulated material procedure, however, whatever be the type of industry, the following duties must be performed regardless of whether or not the exact titles used below are employed, or of whether, as in the smaller plants, several of these duties may be combined in one person.

The function of the engineering department is to ascertain the proper quality of goods and to consider the uses to which each article is to be put. The results are written up in purchase specifications, which are repeated or referred to in the balance sheet. The engineering department must also inspect and test materials upon receipt to see whether they conform with these specifications.

The person in charge of this work must possess technical knowledge of a high order, he must possess firmness, backed by sound judgment, and he therefore requires an intimate knowledge of production needs. He may often be assisted to good advantage by various advisory committees appointed for the purpose.

> THE PERSONNEL concerned with material routine must be organized and physically located to give the greatest serviceability.
>
> Quality is determined by the engineering department; cost by the purchasing agent. Quantity is limited by production requirements.
>
> The storekeeper should work directly under the works manager, the balance clerk under the production manager.
>
> The production office should be close to the manufacturing departments. The balance sheets must be in the production manager's office but near the storeroom.
>
> The cost department should be supervised by the works manager, but located near the balance sheets and manufacturing department.

The purchasing agent is responsible for purchasing all goods as and when called for at the lowest price consistent with quality. He is responsible for the follow-up of all outstanding purchase orders, and for seeing that delivery is made when promised. It is his duty to report at once to the proper person any change in conditions in the market or in transportation which may affect the time or amount of ordering goods. The purchasing agent should possess shrewdness, tact, common sense and ability to hold his own in an argument. Technical knowledge is an advantage.

The balance clerk is called also stock clerk, material clerk, material record clerk. The general function of a central clearing house, as embodied in the balance sheets, is to give all information in regard to material on hand, material outstanding on order, material which has been apportioned or reserved to manufacturing or other needs, and material which may be further apportioned or which is considered available. It is the duty of the balance clerk to keep the balance sheet for each item up to date by posting any one of the above transactions when it occurs, to see that perpetual inventory is accurately maintained, to requisition materials for stock as necessary.

The qualifications of a balance clerk require absolute accuracy, foresight and a whole lot of common sense. I strongly believe that first-class people should be used for balance card work. Bookkeeping is more or less mechanical, but balance work requires an alert mind. Much money may be lost or made at the balance cards.

Besides his general supervisory duties, it is specifically the duty of the works manager as regards material regulation to approve himself, or to delegate this authority to other officials, all replenishment orders before they may be honored by the purchasing agent.

An important duty of the traffic manager is to keep those responsible for the ordering of materials fully informed as to traffic conditions, so that ample allowance may be made for embargoes or other transportation upsets. Ordinarily this information should be reported to the purchasing agent who should then be held responsible for interpreting this and other relevant information into an allowance affecting the time or amount of ordering goods. It is the traffic manager's duty also to receive all goods from the transportation agent, to see that the packages correspond with the descriptions on the way bills or other descriptive documents, to certify the transportation charges to the auditor, and in general to conduct all dealings with transportation agencies.

The receiving clerk unpacks all packages and checks contents against his copy of the purchase order. He makes out a notification of receipt and sends it immediately to persons interested. This notification or an accompanying form must contain information showing action by the engineering department or other inspectors.

The transportation men move materials and apparatus into and out of storerooms and to other designated places as per directions.

The storekeeper is responsible for the receipt into stores, arrangement and stowage, custody, and issue from stores of all goods. He is also responsible for a periodic count to insure accuracy of perpetual inventory, and reduction of spoilage and deterioration.

The auditor checks invoices against notification of material received and notifies the purchasing agent to

secure adjustment for rejected materials. He pays for those goods passing inspection, or if the policy of taking all cash discounts immediately upon receipt of invoice be followed, pays invoices upon presentation.

The cost department sees that proper charges and credits are made and summarized for all materials issued or returned, and that these transactions are properly taken up in the books of account.

Besides these functions, we have that of requesting material for use, exercised by various persons throughout the plant, and finally that of planning, which, while not directly related to material routine, is the center of production activities and enables the accurate forecast of material needs.

Naturally, depending on the size and complexity of the business, these functions may not be exercised by persons as listed above. Fewer persons may be required, or very many more may be necessary in larger plants. For instance, there may be one head material man, under whom would come several storekeepers, several balance clerks, special transportation men and so on. Similarly, the receiving department may be very large in itself, consisting of several men and several stenographers. On the other hand the storekeeper may in smaller plants serve also as receiving clerk, although this practice is open to considerable danger.

Regardless of the number of persons required, however, the functions to be performed remain the same, and ordinarily it is a mistake to split responsibility for any one function among different persons. Thus special considerations may require a usually unsatisfactory arrangement of several detached storerooms each with its own storekeeper. These should all report, however, to one man who heads the storage function.

Relation Between Departments

It is obvious that responsibility for the material routine rests with many officials of the plant. It therefore becomes necessary in individual cases to determine very carefully just what the relation of material regulation shall be to each of the departments affected, as well as the relation among the members of material personnel themselves, so that there may be no overlapping of functions.

Although no general rule can be laid down which will suit all cases, there are yet certain necessary relationships which should not be lost sight of in the distribution of functions in any case. On the one hand, a too great concentration of authority and responsibility may lead to fraud or careless work due to a lack of independent checks. On the other hand, by a too sparsely scattered arrangement work may be so slowed up as to be insufferable. The problem lies in choosing the middle ground between these two extremes. An illogical arrangement of functions, furthermore, may lead to complications quite as distressing as a too broad or a too narrow subdivision. Consider first the four major elements, quality, quantity, time and cost, into which material handling has been divided.

It would seem axiomatic that responsibility for quality of all goods should be centered in the engineering or other technical department. To this department, in the final analysis, must be referred all questions of quality of raw material or workmanship which affect the serviceability of the product which this department has designed. Since this technical department specifies in the beginning the quality of what is to enter into the finished product, it would seem only right that in it be centered responsibility for the inspection of incoming goods to determine whether they be suitable for use in the product.

Where a simple count and observation is all that is necessary, as is usually the case with most factory supplies, authority for inspection may be delegated by the engineering department to the receiving clerk. Responsibility, nevertheless, for this particular work of the receiving clerk must still be centered in the engineering department. There is here no occasion for divided or ambiguous responsibility in the receiving clerk's work, since quality inspection is a function that may be clearly set off from his other duties and for which he may therefore report without confusion to the head of the inspection department. Divided responsibility becomes dangerous only when two persons are responsible for the same function or duty.

Responsibility in Inspection Work

The necessity for central responsibility in inspection work was illustrated in one plant where it was perfectly well understood that all technical inspection was to be done by the engineering department. However it had been tacitly assumed that this office was not interested in or responsible for inspection of materials which did not have to go to the testing laboratory, as such materials had been customarily passed by the receiving clerk without specific directions for him to do so. This lack of a clear definite authority caused the loss of many dollars and delayed completion of work when unsuitable goods were passed for storage.

The determination of what quantity of material to buy usually rests with the production department, and in any event, must be determined through a consideration of production requirements. As indicated previously, and as will be discussed in detail further on, there are two kinds of purchasing, speculative and routine. Speculative purchasing, however, when it is done for a manufacturing establishment, should be limited in amount and in time by dictates of manufacturing needs. A safe rule to follow in this respect is that when the purchasing agent is permitted to depart from reasonably immediate needs of production in his purchases, the burden of proof must be distinctly upon him. In routine purchasing, of course, the purchasing agent is governed strictly by current replenishment orders.

The time element must be similarly divided between production and purchasing, the one specifying when to renew for all items as per balance sheets for production requirements, the other to be responsible for the time necessary to secure the article and for seeing that it be secured in this time.

The responsibility for cost rests of course with the purchasing agent. In practically all cases which I have encountered where losses were frequent, due to poor material management, the underlying cause was directly traceable to an illogical or to an ambiguous delegation of these four functions. Too often, indeed, they were all thrown upon the shoulders of one man, the purchasing agent.

As regards the administrative subdivision among the various other members of material personnel, there exists considerable difference of opinion. Accepting the concept that materials in the sense in which we use the word exist solely for the benefit of production, it would be logical that the balance of stores or worked

material clerk, the receiving clerk, and the storekeeper should all be under production. This arrangement is not at all universal, however. Probably the most common departure is where the storekeeper is under the purchasing agent. This has the disadvantages referred to previously of placing a department, the storeroom, which vitally affects production, under a man whose primary interest lies elsewhere, and of a too great concentration of authority in the lower limits of the organization. These arrangements at times have led to serious consequences.

The ideal arrangement both for purposes of safeguards and for incentive to quick and accurate action would have the storekeeper directly under the works manager and the balance clerk directly under the production superintendent or the head of the planning department. Here again practice differs, since the balance clerk frequently reports to the head of the cost department. Since the average cost accountant does not ordinarily appreciate the vital relation between manufacturing efficiency and control, such an arrangement again usually works out to a disadvantage. With the arrangement suggested, and particularly in the smaller plant, with the receiving clerk under the traffic department, which may in many instances report to sales, informed and energetic action as well as ample safeguards against collusion and fraud are provided. Clerical errors, furthermore, are much more readily caught where one department is working against another in this respect.

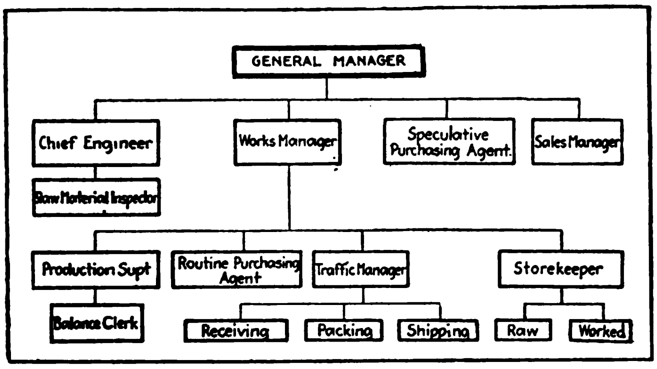


FIG. 1. ORGANIZATION CHART OF MATERIAL PERSONNEL

It must be emphasized, however, that these relations must vary with cases; that they are presented only as an arrangement which has been put in effect with excellent results in several different types of plants and which probably furnishes maximum checks with minimum labor and routine. Fig. 1 shows a skeleton organization chart of this arrangement of the material personnel.

The organization chart shows one satisfactory arrangement of the administrative relations between persons concerned with material routine. Yet even with a satisfactory organization it is always necessary to consider in addition the physical location of offices so that as a whole there may be a convenient working relation between them. The layout of the storeroom proper will be dealt with in a later article but since many cases of faulty work-relationship have come to light due simply to an improper physical location of the persons themselves, it may be useful to indicate some of the considerations which should govern the placing of these various functions.

In many cases the location for any specific department will be self-evident. For instance, in the case of the traffic department or at least that part of it which receives packages, obviously it should be placed immediately contingent to the railroad tracks and truck delivering platforms. This is both for the incoming and outgoing shipments, and necessarily the packing and shipping department should be immediately adjacent to the traffic office, whether or not these departments be under one head.

For convenience in the physical handling of packages, as well as for the transaction of the necessary paper routine, the receiving department should also be immediately adjacent to the traffic department. Here goods are received from the traffic, unpacked, checked with the copy of the purchase order and sent to the storeroom. They should pass a minimum distance from one to the other.

The storeroom, therefore, should be within reasonable truck or elevator distance of the receiving department. This is particularly true of a central storeroom, and of course the location of detached departmental or subsidiary storerooms must be carefully chosen with regard to delivery of incoming and outgoing goods.

I have encountered many cases of faulty operation of the balance of stores function due simply to the location of the balance sheets relative to the other departments with which the balance clerks deal. I consider it absolutely fundamental for effectiveness that the administrative authority for balance sheets be centered in a production official. Whoever may be intrusted with the supervision, however, there is but one logical location for the balance sheets themselves—immediately next to the production manager's elbow or whoever the official may be whose duty it is to look ahead and plan production and material needs. He is the one who has constantly to put future requirements for production against the amount of material on hand, on order, and assigned, and his work is very much handicapped unless balance sheets are instantly accessible.

This would seem almost axiomatic, and yet I have encountered numerous cases where there was a great deal of lost motion on the part of the production manager in sending or phoning to another department for information about material, information which should have been right under his thumb. The balance sheets, moreover, should not be too far from the storeroom, even where adequate automatic carriers are provided. There is much work in connection with stores handling and checking which cannot be done either by the regular factory mail system, by phone, or by pneumatic tube service, but must actually be done in consultation between the storekeeper and the balance clerk.

These and similar considerations point to the conclusion that the planning or production office should be situated just as close to the manufacturing departments and as centrally located relative to them as is possible. Follow-up will thereby be made not only easier, but also much surer and more systematic.

Cost Department Near Factory

For similar reasons I feel that the cost department, as distinct from the general accounting department, should be not only under the supervision of the works manager or the production superintendent but should be physically located close to the manufacturing department, and therefore close to the balance sheets. No matter how smooth a working system we may have, there are always innumerable questions which arise in regard to the correctness of time or job tickets, stores

or worked material issues and credits. inspection slips and numerous other sources of information which have to be adjusted in consultation between the storekeeper, the balance clerk, the cost clerk, and the foreman. Here again, any sort of communicating service will serve only for a portion of the adjustment. Ordinarily they must be made in person. When one has but to step out of his door as it were, to adjust some small matter, he is very much more likely to do it, and certainly can be very much more readily held to account for not doing it, than would be the case where this adjustment necessitated a long trip back and forth.

The general accounting offices, on the other hand, may be located wherever convenient, and it is very customary to find them in a large city many miles distant from the factory itself. There is no direct connection between general accounting and the shop. Most of the means by which costs are tied into the general accounts through reports of the cost office to the general accounting office and back again, should be worked up in the form of exhibits for the guidance of administrative officers anyhow, so that the general accounting offices may be located wherever desirable without inconvenience.

The location of the purchasing agent's office similarly may be wherever desired, although ordinarily this should be much closer to the works than the general accounting office, because of the constant necessity of consultation and the constant passage of papers between the purchasing agent and numerous other officials of the plant.

It will be understood that the above considerations apply to the plant of medium size. With increasing size, the problem of securing a balanced arrangement among various departments becomes increasingly difficult until in a plant of very large size decentralization becomes desirable. We then get back in considering individual units to the problem of the moderate sized plant just discussed. In every case, however, administrative relationships and the physical layout must be arranged so as to secure the greatest serviceability between related departments.

The Little Shop Around the Corner Is at Bat

By W. F. Sandmann

Ask any machine tool salesman what question has been hurled at him most frequently during the last six months, and almost invariably he will answer that it has been, "Who in the world is buying machinery nowadays?" or its equivalent—probably couched in more highly expressive language.

The belief of a great many manufacturing executives, especially in the large plants, is that the factories of this country are fairly bulging with surplus equipment that they or no one else have any use for. They throw up their hands in horror or try to laugh out of their office the salesman that dares to suggest new machine tool equipment.

The alert machine tool salesman is now avoiding the big plants, almost to the point of neglect, and is wandering up the byways and side streets to the little unpretentious concrete block or frame building that shelters the shop that is doing the business. He doesn't find a cork-floored waiting room and an attendant at a mahogany information desk to take his card. When he enters the door he walks right into the shop proper and when he inquires of the nearest lathe hand for the proprietor he has pointed out to him the operator of a grinder or drill press who from outward appearances is a workman of the rank and file.

The salesman doesn't expect this proprietor-workman to stop working while he talks to him for the proprietor of the "little shop around the corner" is a busy man. Instead the salesman is more than likely to lend him a hand to lift a heavy piece of work on the machine while at the same time he explains the merits of some particular new equipment which he thinks will interest this working-manager. He finds him a ready listener and he is not laughed at when he broaches the subject of new machinery here, for the little shop around the corner is in the market.

Its big brother around the corner on the main street finds competition hard. The acres of buildings and the backbone of an organization that it must keep if it ever expects to do business again means that a sizeable overhead must be met on every article produced. The overhead of the little shop is the rent, power and the salary of the office girl.

During the rush times the machinery manufacturers and dealers wasted but little time on the struggling mechanic that sought to build a business of his own up the side street. Then the big plants were taking the machine tool output without quibbling about the price. Delivery was the thing and it was with difficulty that enough tools were produced to satisfy their demands. What time was there for the little shop that wanted but one tool, and that on terms extending over a number of months? The result was the little shop couldn't get the equipment it wanted then.

But now their turn has come. The little shops around the corner are at bat now and a home-run harvest they are reaping too! Recent radio developments have put hundreds of the little shops "on their feet" with a vengeance. The demand for cheaper automobile and screw-machine parts has helped them. The big plant with the idle equipment can't touch them when it comes to a bid, for they don't have to figure in the upkeep on scores of polished desks when they make a price.

Do the owners of the little shops scour the used tool market before buying? Of course they do, but when all is said and done the greater portion of the equipment they install is new, for they are too good mechanics to be led into buying the worn-out machinery of the rush time. They get new tools and they keep them new by constant personal attention because they have no money to throw away. Besides, new equipment is alluring in a way. It holds out promise of unlimited working life and there is comfort in the knowledge that when a machine is set up it will require no overhauling or replacement of parts before it is ready to do a day's work, and the repairman will be unnecessary for a long time.

Some of these little shops around the corner will grow and grow and spread out and accumulate overhead and some day be large enough to move out beside their older brothers on the main street. But just the same when business hits one of its inevitable periods of low ebb they will have to watch their step or some new little shop around the corner will be picking off the juicy morsels.

It's all in the cycle of manufacturing though; and what a truly life-saving cycle it is for the "peddler" of machine tools and the factories he represents.

The Grinding of Gear Teeth and Its Future in the Industry

Application of Ground Gear Teeth in the Automotive Industry—Overcoming the Effects of Heat-Treatment—Elimination of Noisy Gearing by Grinding

BY R. S. DRUMMOND
Vice-President, Gear Grinding Machine Co.

THE production of gears for accurate and noiseless operation has been a problem for many years and the refinement of the machinery and methods of manufacture have gone forward with each year. We are indebted to the demand in automobiles for silent operation for a great many improvements in the methods and machines for the production of machine parts of great accuracy and low cost. This article will deal largely with the application of ground gear teeth to automobile transmission gears, as this is the field which has so far used the greatest number of gears with ground teeth. This large use of ground toothed gears is proportional to the use of heat-treated gears, and has been brought about by several natural influences, such as:

a—The demand for silent operation of gears loaded and idling. The willingness of sales agents to acknowledge that noisy operation was an evidence of inefficiency and wear;

b—The demand for an unusual long life of gears without wear of the teeth with its accompanying gear noises.

c—The demand for a hardened tooth surface, which introduced the distortion due to high temperatures of heat-treating processes;

d—The need to eliminate the last ounce of unnecessary weight.

THE GENERAL RESULT

The general result of these demands is the present-day transmission. With all its faults it is one of the most serviceable and satisfactory parts of the car construction, so long as it operates without noise.

Aside from the auto-transmission the following are some important uses of ground gears:

a—Gears made of high manganese steel (approx. 13 per cent Mn.). This composition of steel can be machined only by grinding. Gears as large as 33 in. in diameter, 20 in. face and of ¾ diametrical pitch have been ground in our shops at Detroit. These gears and others like them are in use for as long as six years without injurious wear and have replaced other similar gears which had a normal life of six to ten months. The long life of these gears is due to the high manganese content and to the fact that the initial construction provided working surfaces which were properly finished to a smooth and accurate tooth shape.

b—Main drive gears of large electric locomotives. The first attempts at gear drives of this type were noisy and increasingly so as used, due to tooth wear. An effort was made to modify the objectionable sound and wear by the use of special teeth—spiral spurs, herringbone, etc. Then the plain spur gear type was tried with the tooth shape accurately and smoothly ground, and this is the accepted standard today, as it permits the use of heat-treated gears and the finishing of the teeth to such form and shape as will operate quietly and with minimum wear.

c—Airoplane driving gears, used especially by designers where power transfer is necessary between multiple power plants, and combinations of propellers in planes of large size.

d—Geared speed reductions of the spur gear type, where large horsepower is transmitted and the operating speeds are high. During the war such heavy-duty speed reductions were in demand and many sets were produced which operated under very large loads without objectionable noise.

e—Work on tractor gears—These gears were saved for good standard use at only a fraction of their first cost by the resurfacing of the teeth.

f—Plain bevel gears and pinions such as are in use in rear axles of automobiles. Many thousands of these gears have been saved for good use, literally taken from the scrap pile and converted into good silent drives.

g—The field of broaches and gages lends itself to treatment similar to gear grinding when the external surface is toothed or splined. There is also a large field of usefulness closely related to gear tooth grinding in the grinding of the splined portion of shafts.

A short review of the attempts at gear tooth grinding is of interest.

a—The earliest effort on record was made by a gear foundryman as early as 1874, at which time emery wheels were described in the patent file showing the wheel molded to the approximate shape of the tooth space. This wheel passed between the teeth, removing some roughness and burrs. This in no wise constitutes the placing of a finish gear tooth on a gear tooth—it was simply a roughing operation intended to replace the hand truing which had previously been done with files or chipping hammer.

b—From this date little is disclosed until the effort was made in a Leland-Ferris bevel gear grinder, shown by the patent files in 1898, at which time the edge of the wheel was used with a generating type of machine to form a surface on bevel gear tooth.

c—About this same time Cheney developed a similar machine, very little different from the Leland-Ferris type.

d—In about 1891 the Fellows Company produced a generating type of machine showing very little change from previous work done by Leland and Cheney.

e—A machine was developed in Germany by the Reinicke Co., of Chemnitz, Germany. This machine used the side of the emery wheel and generated the gear tooth form.

f—Patent files show in 1906 a Phelps spur gear

Paper presented at Buffalo convention of the American Gear Manufacturers' Association.

grinder which again is a generating type of grinder.

g—We also have in this country today generating types of machines manufactured by Pratt & Whitney, Garrison, and Less-Bradner Co. These machines are all of one general type, using the edge or the side of the emery wheel in generating the curve on the tooth surfaces. One distinctive type of gear tooth generated with emery wheels is shown in the patent of the Brown-Lipe Co. under patent issued to A. T. Brown in 1914. This machine operates with a very large segment wheel sufficiently large in diameter to approximate a flat surface where it contacts with the tooth in the grinding operation.

h—There are two other unusual types of machines for correcting tooth form. One of these is an experimental machine in use in some factories where a mechanical stoning device is in use; a piece of flat stone is rubbed against the tooth surface by the generating process. This is an awkward, inefficient and inaccurate device.

i—The second of these peculiar machines is represented by the device gotten up by Adler at Frankfurt-am-Main, where formed diamonds were set very accurately to the shape of the tooth to be formed and these diamonds so set were used as a means of trimming the revolving wheel, which was then placed against the work. It was necessary, as you will understand, to re-set these diamonds whenever they wore down. This method utterly failed.

j—It will be noted from the foregoing that a great many people have spent considerable time in an effort to properly generate the tooth form with emery wheels, in contradistinction to shaping the tooth form by the direct cutting section of the wheel when operated in the same way as the ordinary gear cutter.

With this short history of gear grinding, it can be realized that the original work done by the engineers of the Gear Grinding Machine Co. was accomplished along entirely different lines of effort. They sought to reproduce from master forms a gear tooth form upon the wheel, it being possible in a few moments to retrim the wheel and so replace the worn form without losing the setting of the machine.

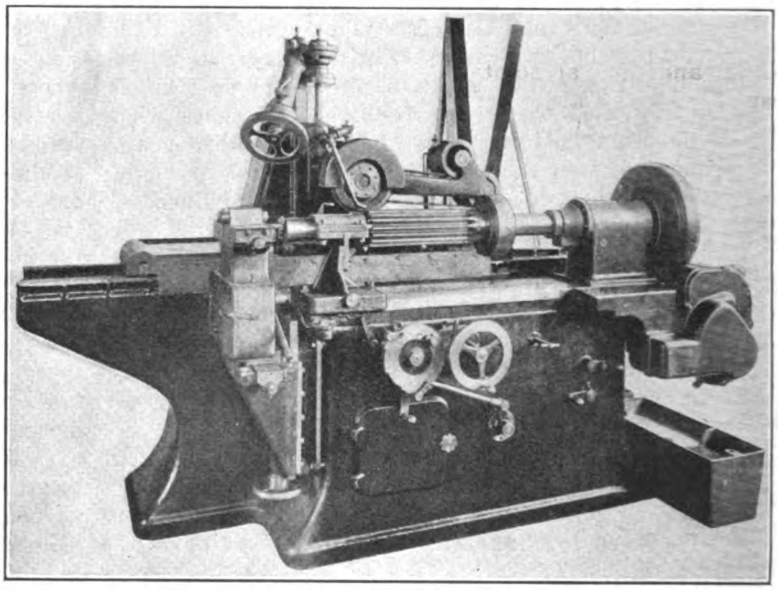
It is possible on the Ward gear grinder, shown in the illustration, as used by our company, to first trim the wheel and use it for a roughing operation around the gear, removing the most serious inequalities and the extreme distortion of the heat-treatment. Then to re-trim the wheel with great accuracy and remove from the teeth a finishing cut of very small amount, giving a perfect reduction on the tooth surface of the master forms from which the diamond trimmers are operated.

The wheel normally passes between two teeth, finishing adjacent sides of two teeth and bottom of the spaces, although it works with facility on one side of one tooth without grinding the adjacent side of the next tooth if desired. You will realize further that this gear grinder finishes the surface of the tooth from top to bottom as it passes over the tooth without small strokes which are used in some generating types of machines.

There are two distinctive uses for the grinding process for finishing gear teeth.

(1) The resurfacing of gears which have already been "finish cut" to size.

(2) The surfacing of gears which have been left with grinding stock.



THE WARD GEAR GRINDING MACHINE

Under the first of these headings we refer to the large volume of business which was done by gear grinders during the first five years that this work was actively done. The process was then used principally to salvage parts which had not passed inspection due to malformation of the teeth or distortion of their shape in heat-treatment. It is probable that one million gears have been resurfaced with gear tooth grinders with a large saving to the automobile industry. These gears, as a whole, were scrap parts which it was impossible to salvage by other processes on account of the high cost. When saved by this process of gear grinding the backlash in the gears was increased by the amount of stock which was removed from the surface of the teeth when they were corrected. This stock averaged from 0.003 to 0.006 in. on the tooth surface, adding backlash to a given gear from 0.006 to 0.012 in. in a tooth space, and such gears mated together would normally show an increase in backlash somewhere between 0.012 to 0.015 in. We will touch on the subject of backlash later.

The second division as mentioned above is the finish grinding of gear teeth which have been rough cut leaving grinding stock. Today this constitutes the largest volume of gear tooth grinding. The tendency of the market on gear teeth is decidedly toward this method of gear production, especially where the teeth are required to contact noiselessly at high speeds, and more particularly in automobile transmissions where the gears are heat-treated so that wear on the teeth will be small. In this portion of the gear tooth grinding business the refinement of the article, the finish of the gear tooth and its accurate form, is produced after the heat-treatment. This feature is really new to many people and yet it is very simple to understand, being exactly parallel to the work which is done on all other important surfaces used in the transmission of power.

The question is being asked, and asked properly: Should we use expensive machines and tools of extreme accuracy for finish-cutting, all tuned up and scraped to the last degree of accuracy; should we use

expensive refined cutters made with the most accurate form and shape, designed for production of teeth with maximum degree of accuracy; and then plunge the pieces at high temperature into a bath of oil or water and blame the results on anything but our own poor practice?

Years ago they turned shafts by accurate tools on most accurate machines, but today they leave grinding stock and finish-grind. Grinding has become so accurate a process in most parts for power transmission that roughing these parts on tonnage production machines has become standard practice.

During the last month we investigated twenty-three individual lots of gears for other companies. We found a wide variety of error, but the very largest was the distorted shape of the teeth due to heat-treatment. We have had teeth under test which could only have been produced on a rubber mandrel, or by distortion after machining, one tooth being slanted east and others slanted west. On the same gear, curves were low at points and high at points due to heat-treatment. We have heard a lot about heat-treatment within 0.0002 in., but we have not seen the evidence in quantity production. We have such high respect for temperatures over 1,000 deg. F. that we prefer to keep finished parts at a reasonable distance from them or grind the surfaces of parts after heat-treatment.

In an effort to overcome the warpage of heat-treatment the following methods have been used:

(a) Rolling gears together, then filing or stoning them to a smooth roll and a good appearance.

(b) Running the gears together relatively dry, permitting them to wear down the high spots and correspondingly wear grooves in the mating gears. Certain combinations of gear teeth can be improved in their roll by wearing a groove in one gear opposite the projecting rough places on the opposite gear. In the case of a "hunting" tooth, every tooth in the mating gear is thus damaged by the inequality in the mating gear.

(c) Running the gears together with a lapping compound causes maximum wear at the point of maximum pressure. This is like the previous method, but very much accelerated.

(d) Remating gears by hand rolling. Some operators when working on a limited number of types of gears become quite expert in mating gears with others of corresponding tooth curves. Thus they pick out a pair of gears with equally low curve position, etc. They do not always know what the result is, except that experience has shown them that the parts will work together. This process fails under severe or varied operating conditions.

(e) Mating gears by mechanical or optical measurement of the tooth form. This field holds a great benefit for the industry as soon as its use and application is cleared up.

One must consider that in a gear making tooth contact 14,000 times per minute, irregularity of contact will cause peculiar sounds. Many improperly shaped teeth cause an abrupt acceleration of the mating gear and equally abrupt slowing down. This reversal of acceleration occurring thousands of times per minute gives a harsh sound and produces rapid wear. A most common error is misplaced involute curves and irregular surface contact which cuts the oil film.

In the shape of the involute curve the shape is approximately radial near the base circle, whereas at the top it is very much rounded and falls away rapidly from a radial line. If this curve is misplaced downward as much as 0.005 in. this misplacement will effect the part of the tooth near the base circle very little but the effect at the top of the tooth is quite severe.

This effect occurred recently in a confusing manner. Idler gears were ground accurately from the bore of the gear, but made noise in the assembled transmission. Upon inspection of the idler it was found to be bushed and the bushing was eccentric, causing the tooth form to be high on one side and low on the other. The noise was not a sound of eccentricity, but a low growling sound. New accurate bushings corrected the tooth form position. One interesting feature of this transaction was that one idler which was cleaned up accurately with the tooth position and which was a loose fit on the shaft was relatively quiet.

(To be concluded in next week's issue.)

Alloys of Aluminum

Why Copper Alloy Is Preferable—Superior Casting Properties of Aluminum Alloys—Casting Alloy No. 12—How To Machine Alloys

FROM SALES DEPARTMENT CONDENSED DATA PREPARED BY THE TECHNICAL DEPARTMENT, ALUMINUM COMPANY OF AMERICA

THE two principal alloying ingredients of aluminum casting alloys at the present time are copper and zinc, usually taking the form of aluminum-copper or aluminum-zinc-copper alloys. Manganese and magnesium are frequently used. Nickel, chromium, tin and other metals have been alloyed with aluminum with varying degrees of success, but their application has never been very extensive and their use is advisable only in very special cases. Under certain conditions, bismuth, cadmium...

> INCREASED TENSILE strength and hard- ... in shrinkage, decrease in ... n ductility, are the re- ... ng aluminum. ... well and give little ... ouble. ... o temperature, which ... requires very careful ... es a sharp, sound cast- ... re harder, stronger and ... luminum. They have ... l to No. 12 Alloy and

...tility to decrease is present and it increases as the amount of aluminum increases.

In the United States the inclination of manufacturers toward the use of a very small number of standard alloys is, we think, a logical one. It is logical because the possible range of physical properties except for special purposes, may be obtained by the proper manipulation of very few of the infinite number of combinations of aluminum with other metals; because of the economies following increased efficiency of the foundry which standardizes on one or two satisfactory alloys; and last, but not least, because of the increasing good will which accrues to the account of the foundry turning out a uniform and reliable product.

The useful aluminum alloys may be divided into two groups: (1) Those of aluminum with not more than 20 to 35 per cent of other metals, and (2) those of other metals containing not over 10 to 15 per cent aluminum. Usually, alloys lying between these limits have no commercial value. Alloys of the former class are generally referred to as "light aluminum alloys" and those in the latter class as "heavy aluminum alloys." It is with alloys of the former class that we are here principally concerned.

All the useful alloys of the aluminum-copper series may be placed in one or the other of the two classes: Those containing less than 15 per cent copper, and those containing less than 11 per cent aluminum. The first class embraces the alloys most applicable to general casting purposes in the aluminum industry. The addition of copper increases the tensile strength and hardness, reduces the shrinkage and improves the machining qualities of the pure aluminum. The alloying also decreases the elongation, and thereby detracts from the toughness of the metal and ultimately limits the amount of copper that can be added. It has been found that an alloy composed of more than about 15 per cent of copper is not of practical use. However, if the copper content is kept well within this limit, the alloy is sufficiently tough for most uses. Because of the nature of their constituents, alloys of this class are not subject to burning in the foundry, as are alloys containing more volatile metals.

The copper content in this series of alloys is now fairly well standardized. After years of experimentation and commercial practice in which almost every combination of aluminum and copper has been tried, trade sentiment has gradually crystallized in favor of an alloy containing from 7.0 to 8.5 per cent copper.

This amount of copper produces a tough alloy the tensile strength of which will vary from 15,000 to 20,000 lb. per square inch, depending upon the casting conditions. It casts well and gives little trouble from checking and drawing of the casting, and is the one most generally used for all-round aluminum casting work. It is commonly known as No. 12 Alloy and will be discussed in detail later.

Alloys containing a higher copper content than this are sometimes used in the United States for castings which are to be subjected to high temperatures, water or steam pressure. A high copper alloy is frequently used in the die-casting industry because of its relatively low shrinkage. Inasmuch as castings made from such alloys may fail if subjected to repeated shocks and stresses, foundrymen should inform themselves as to the purpose for which the casting is required before they attempt the use of such alloys.

Alloys of the second class, containing less than 11 per cent aluminum, are known as aluminum bronzes. The aluminum content usually ranges from 1 to 10 per cent, that containing 10 per cent aluminum probably being most popular. A greater amount makes the metal hard and brittle, for the effect of aluminum is very similar to that of copper in the light alloys of aluminum. The tensile strength of aluminum bronzes is high, and ranges from 80,000 to 110,000 lb. per square inch. These bronzes do not corrode readily, and have a great resistance to alternating stresses, being superior to some steels in this respect. However, a detailed discussion of the aluminum bronzes will not be attempted here, for obviously they do not fall in the class of light aluminum alloys now under consideration.

Intermediate alloys of the aluminum-copper series, ranging from 15 to 90 per cent of copper, give crystalline and brittle grayish-white alloys of no use. After about 80 per cent of copper is reached the red color of the copper begins to show.

Zinc Sensitive to Temperature

The useful alloys of the aluminum-zinc series may, like those of aluminum and copper, be divided into two classes: Those containing less than 33 per cent zinc, and those containing a relatively small amount of aluminum.

The first class comprises the useful zinc casting alloys. Zinc produces a very strong alloy with aluminum, the tensile strength running as high as 38,000 lb. per square inch for the alloy consisting of 50 per cent zinc and 50 per cent aluminum. Such an alloy, however, is excessively brittle. The decrease in ductility of these alloys as the zinc content increases places the maximum of zinc at 33 per cent, and even this is much too high if the casting is expected to withstand stresses. The best aluminum-zinc alloys usually possess considerably less zinc than this. Zinc tends to give additional fluidity to aluminum, and produces sharp and sound castings when skillfully cast.

For forging, few metals excel an alloy containing from 10 to 15 per cent zinc. This alloy is tough, flows well under the forging dies and produces a finished product which is solid, easily machined and remarkably strong per unit of area. Castings made from aluminum-zinc alloys machine well, and the machining qualities improve with aging of the metal.

Alloys of this class seem to be unusually sensitive to irregularities in the casting process. If the metal is overheated there is danger that the zinc may be burned out. In addition, these alloys are more subject to drawing in heavy parts or lugs than are the copper alloys. This tendency, however, can in most cases be overcome by proper gating, suitable chills and risers, and adequate temperature control. Zinc alloys are unusually sensitive to high temperatures, and therefore cannot be used where the casting will be subjected to considerable heat. A casting made from a 25 per cent zinc alloy when raised to a temperature of 100 deg. C. loses one-third of the tensile strength it possessed at 20 deg. C. Zinc alloys have never been very popular in the United States. Doubt in the minds of many as to their freedom from deterioration with age has probably had much to do with their limited use. Recent tests by Rosenhain and Archbutt, however, seem to disprove such deterioration. The ease with which zinc alloys may be injured in the melting process may also account to a certain extent for their unpopularity. A better understanding of the peculiarities of this series of alloys will undoubtedly result in their more extensive use, particularly for small inexpensive castings which are not to be subjected to severe shocks or strains.

Alloys in the second class of the aluminum-zinc series, those composed of relatively small amounts of aluminum, are known as aluminized-zinc. The aluminum content is usually 5 or 10 per cent. These alloys are used in zinc galvanizing baths to make the bath more fluid and to clear it of oxides, and in the manufacture of aluminum brass, but they are never used directly as are the aluminum-zinc casting alloys.

Zinc-Copper a Favorite Alloy

As previously stated, an alloy of aluminum and zinc has never been very popular in the United States. Where zinc is used the trade favors the addition of small quantities of copper. Copper increases the tensile strength, improves the casting qualities and gives greater rigidity to the aluminum-zinc alloy. In England an alloy composed of 13 per cent zinc and 3 per cent copper is used quite extensively. In the United States an alloy containing 15 per cent zinc and 3 per cent copper finds most favor, and is known to the trade as No. 31 Alloy. These alloys, either with or without the addition of copper, have never been as popular in the United States as they are in Europe, especially in England, where such an alloy holds much the same prominent position as No. 12 Alloy occupies in the United States, being used for automobile castings and for casting work in general.

In general, manganese influences aluminum in much the same manner as copper, renders it first both harder and stronger but less ductile, and subsequently decreases the strength as well as the ductility. Manganese alloys are very resistent to corrosion, being superior to the pure aluminum in this respect, the resistance increasing with increase in the manganese content. These alloys are most frequently rolled into sheets, but as 1½ and 2 per cent manganese alloys are dense and close grained, they are not infrequently used for casting small parts, such as pipe fittings, which are to be subjected to water or steam pressure.

Alloys of magnesium with aluminum are usually known as magnalium. Because of the great affinity of magnesium for oxygen, these alloys tend to form considerable dross on remelting unless the magnesium content is low. As a result, it is not generally good practice to add more than 5 per cent magnesium. Most alloys

possess even less than this amount, and few commercial alloys carry over 2 per cent magnesium.

Magnesium alloys are harder, stronger and lighter than pure aluminum. Their tensile strength is practically equal to that of No. 12 Alloy, and their elongation is greater. Magnesium tends to make the mixture more fluid at low temperatures.

Magnesium may be introduced in the following manner: The pure magnesium is held in a pair of iron tongs and pushed slowly to the bottom of the crucible after it has been removed from the fire, or in the ladle just before pouring. It must be stirred slowly until the magnesium has completely melted from the tongs as determined by the sense of touch. The magnesium should be added in small amounts. If a long stick is pushed into the crucible it may break and the broken pieces float to the surface, where they will catch fire before they are melted, taking oxygen from the air instead of from the aluminum or the dissolved gases. After sufficient magnesium has been added more vigorous stirring should be continued for a short time in order to give the oxide of magnesium a chance to float to the surface. Then it should be poured and skimmed in the usual way. No other flux is necessary. Care should be taken to see that the tongs and magnesium are dry, to eliminate violent action and danger in introducing the magnesium.

Other Alloys Less Useful

Nickel is sometimes used as a hardener for aluminum, and produces practically the same effect as copper. However, as nickel costs more than copper, and as it has been found very difficult to make the nickel-rich alloy for incorporating the nickel in the melts, there is very little possibility that nickel will supplant copper as an alloying ingredient. The nickel content should never exceed 5 per cent, for a 5 per cent alloy develops practically the full tensile strength that can be obtained without decreasing the elongation to such an extent that the casting would be unsuitable for commercial foundry work. Aluminum-nickel alloys for casting purposes will probably never be used very extensively.

Small proportions of tin are sometimes advantageously used with aluminum to give greater strength and rigidity to heavy castings as well as to reduce the shrinkage of the metal. Tin also serves to give sharpness to the outline of the casting. This tendency, however, to reduce the elongation to the point of impracticability prevents the general use of tin-aluminum alloys.

No casting alloys of any value are formed by alloying aluminum with iron. A small amount of iron always occurs in aluminum as an impurity, but is only detrimental when it exists in amounts exceeding 1.5 to 2.0 per cent. The effect of more than these percentages of iron is to dangerously reduce the elongation. It also makes the molten metal sluggish, necessitating a higher temperature in the furnace with the consequent tendency toward blow holes and shrinkage cracks in the finished casting. There are very few commercial metals not chemically pure which contain as little iron as does the aluminum upon the market at the present time. Aluminum is extensively used as a deoxidizer in the manufacture of steel and is used in the form of the commercially pure metal.

Silicon in the ordinary casting alloys hardens the metal, reduces elongation and affects adversely the machining qualities when it occurs in too large quantities. Care should always be taken to keep the silicon content low, not exceeding 1.0 to 1.5 per cent.

Preparing No. 12 Alloy

As manufactured by the Aluminum Company of America, Number 12 Alloy consists of 7.0 to 8.5 per cent copper and not over 1.7 per cent other elements, balance aluminum. When properly cast this alloy can be depended upon to have the following physical properties:

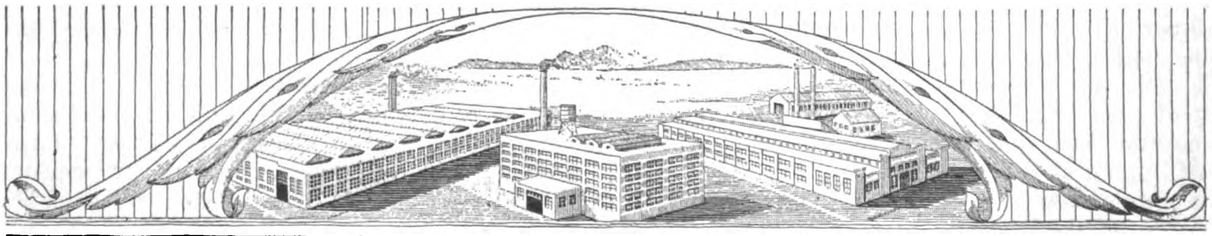
Tensile strength, pounds per square inch, sand cast	18,000
Elongation in 2 in., per cent	1.5
Specific gravity	2.84 to 2.87
Brinnell hardness (10 mm. ball at 500 kg.)	50–65
Shrinkage in inches per foot	0.18
Electrical conductivity, annealed copper taken as 100	30–35

The alloy is made in lots of approximately 11,000 lb. per heat. Each heat is carefully guarded as to the amount and quality of the ingredients, is melted under rigid pyrometric control and is subjected to detailed chemical analysis.

This alloy is used extensively in the automobile industry for crankcases, transmission housings, oil pans, etc., and for all general casting purposes which call for a tough and strong alloy capable of withstanding repeated shocks and vibration. It was successfully used in the difficult Liberty motor castings, for which the requirements were exacting and the inspection very rigid.

The time saved in machining aluminum is often sufficient to make an aluminum casting requiring a great deal of machining, cheaper than an iron or brass casting of the same kind. Tools should be operated faster for aluminum than for brass while the feed should be slightly slower. A good lubricant should always be used. For boring and reaming pure lard oil is the best, while for turning and facing, a mixture of lard oil and benzine, 50 per cent each, works well. For all jobs of tapping and chasing and for general work, an ordinary non-alkaline cutting compound is used.

Tools should be ground with plenty of clearance; that is, they should increase slowly in thickness from the edge. A razor blade is an example of extreme clearance. While tools for machining aluminum should not, of course, have clearance to that same degree, they should have considerably more than similar tools used for machining brass or iron. The cutting tools should have a highly whetted edge such as would be used in woodwork, for dull tools will tear and drag the aluminum.



Geometric Progressions by Short-Cut Methods

The Value of These Progressions to Standardization—Four Simple Methods—How They May Be Utilized in Machine Design

By LUTHER D. BURLINGAME
Chairman, Sectional Committee of A. S. M. E. and S. A. E. on Standardization and Unification of Screw Threads

THE use of geometric progressions for proportioning mechanical work has been greatly increased in recent years, because there has been a growing realization that for many purposes proportions are best graded when in geometric progression. This is true, whether it is a question of the proportion for spindle speeds from the slowest to the fastest, for feeds from the finest to the coarsest, or of the proportion for screw diameters, wire gage sizes, key sizes, or diameters of arbors, or whether it is determining the capacities or proportions of a series of machines.

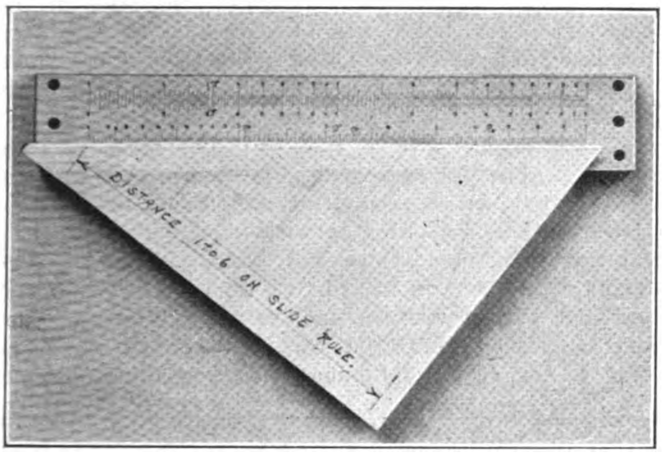


FIG. 1. GEOMETRIC PROGRESSION FOUND WITH SLIDE RULE AND CROSS-SECTION PAPER

Recent work in standardization has brought the advantage of the use of geometric progression very prominently to the front, and one of the first tests to be applied to any new line of standardization is whether the sizes or proportions recommended follow a geometric progression.

The principle of having the feeds of machine tools such as milling machines, for example, follow a geometric progression, has been used for a great many years. The Brown & Sharpe milling machines on the market in the '80's had belt feeds so proportioned, and geared feeds and speeds have since followed the same rule. In 1895, Carl G. Barth took out a patent for a feed operating device which included a train of gears in geometric progression, and in this patent he emphasized the importance of proportioning the feeds in such a progression.

The German engineers, in their recent standardization work, have proposed a series of "preferred numbers" in geometric progression, these numbers ranging from 10 to 100. In the "20" series the selected numbers are spaced in geometric progression from 10 up to 100 in twenty steps, making twenty-one preferred numbers in the series. The alternate numbers produce a "10" series of eleven preferred numbers, while again taking the alternate numbers of the "10" series produces a "5" series of six preferred numbers, so that different requirements can be filled depending upon how close the succeeding steps should be to each other. This all tends toward uniformity in scientific work and correlates the varying lines of standardization.

In many cases an approximation only is desired in the nearest round numbers. But this must be one that still approaches a geometric progression, and is based on that principle. When such is the case, short-cut methods which can be readily used become especially useful. This applies also to standardization and similar work which requires reviewing or inspection and where such methods can be used to check the work of others.

I have found several different short-cut methods that have proved convenient, and the one to be chosen depends on the particular conditions of the problem. As these methods may be useful to the reader, I will describe them with simple problems to show their application. The first method can be applied if a slide rule and cross-section paper are available.

As an example, find the proportion for the shaft keys of shafts from 1 to 6 in. in diameter. It is determined that to adequately provide for the needs, there shall be thirteen sizes of keys within this range. Both the keys and the diameters of shafts where the keys change from one size to another, to give the best range, should be in geometric progression to the nearest even fractional sizes.

To find the geometric progression for diameters of shafts between 1 and 6 in., space with a compass on the slide rule the distance from 1 to 6. On the section paper with the compass so set, strike a radius until it intersects some line which can easily be divided into twelve parts because there are twelve steps in the series. For example, 3 in., divided into quarters give twelve steps.

TABLE I. PROPOSED STANDARD FOR KEYS
13 Sizes, 12 Steps.

Shaft		Key	
Geometric Progression	Approximate Fractional Size	Geometric Progression	Approximate Fractional Size
1.00	1	0.250	1/4
1.16	1 3/16	0.290	5/16
1.35	1 3/8	0.338	3/8
1.57	1 9/16	0.393	7/16
1.82	1 13/16	0.456	1/2
2.11	2 1/8	0.529	9/16
2.45	2 1/2	0.612	5/8
2.84	2 7/8	0.712	3/4
3.29	3 1/4	0.828	7/8
3.82	3 7/8	0.960	1
4.45	4 1/2	1.115	1 1/8
5.15	5 1/8	1.295	1 5/16
6.00	6	1.500	1 1/2

Draw a diagonal line where the radius intersects the 3-in. line. The quarter inches on the cross-section paper will subdivide the space on the slide rule from 1 to 6 into twelve equal parts. After the paper has been cut or folded along the line of the diagonal as shown in Fig. 1, it may then be laid against the graduations on the slide rule and the sizes of the shaft in geometric progression read and tabulated. These results will be found in Table I where the approximate fractional sizes selected are also given. When the smallest and largest keys to be used are determined, the geometric progression between these limits will indicate the proportions which the keys themselves should follow. Table I gives also the geometric progression of keys from ¼ to 1½ in. and the approximate fractional sizes.

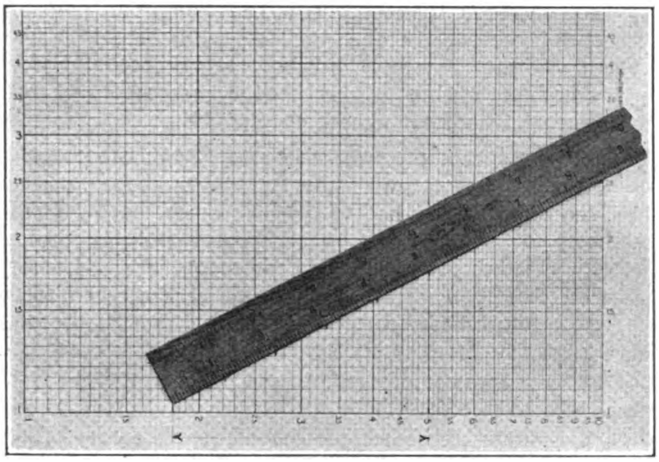


FIG. 2. GEOMETRIC PROGRESSION FOUND WITH LOGARITHMIC PAPER AND SCALE

Where logarithmic paper is available it can often be used to advantage for this kind of a problem. As an example, design a line of milling machines of six sizes with the longitudinal travel of the smallest 18 in. and of the largest 30 in. To have the longitudinal travels vary in geometric progression, divide the space on the logarithmic paper between 18 and 50 into five equal parts. This can be done by laying an ordinary scale diagonally on the paper at such an angle that 5 in., as five steps are required, coincide with the lines 18 and 50 as illustrated in Fig. 2. Each inch space on the scale will represent one of the steps in the series. The figures given in Table II will thus make up the range of longitudinal travel such a series of milling machines should possess.

TABLE II. MILLING MACHINE SERIES
LONGITUDINAL TRAVERSE
6 Lengths, 5 Steps

Geometric Progression	Selected Series	Geometric Progression	Selected Series
18.0	18	33.1	33
22.1	22	40.7	41
27.1	27	50.0	50

In another method which suggested itself as especially convenient for many problems of this character, the slide rule is set in a block of wood, so that an ordinary foot rule and triangle can be used in connection with the block to read off the proportions. The block shown in Fig. 3 answers all the requirements. It may be of interest to note that this block, made by a patternmaker, was completed within seven minutes from the time the job was first put into his hands. This period includes the time required for instructions as to what was wanted. This is mentioned as an illustration of how simply and cheaply many jobs may be done and prove satisfactory, if conducted in the right way.

TABLE III. DIAMETERS OF BEARINGS
FOR SERIES OF LIMITS AND TOLERANCES
5 Diameters, 4 Steps

Geometric Progression	Selected Diameters	Geometric Progression	Selected Diameters
0.500	½	3.230	3¼
0.932	1	6.00	6
1.730	2		

To illustrate the use of this apparatus in connection with standardization work, determine the sizes of the bearings at which the tolerances and limits should be increased in a series up to 6 in. in diameter, and assume the proportions to be varied in six steps. If ½ in. is assumed to be the largest size of the first step and 6 in. the largest size of the final step, then the geometric progression of five sizes, or four steps, between these limits can be found. One end of the scale is placed on the block in line with 0.5 on the slide rule using a triangle to secure the correct alignment. The triangle can then be moved to 6 on the slide rule and the scale swung with the end resting against the steel rule as a pivot until the 4-in. point on the scale, as four is the required number of steps, intersects the edge of the triangle. Then the reading on the slide rule, when the triangle is brought in line with each even inch of the scale, will give the desired geometric progression.

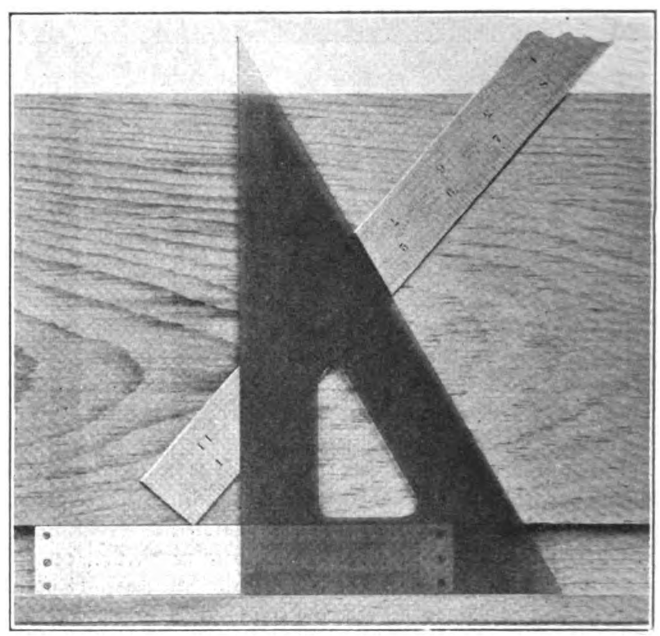


FIG. 3. SIMPLE APPARATUS TO USE WITH SLIDE RULE

This involves a condition which did not exist in the first two problems, where the largest size is more than ten times the size of the smallest. Therefore this requires that the reading shall be on the upper scale of the slide rule where the series is repeated, although by extending the slide of the slide rule as in Fig. 4 it could be read on the lower scale if greater accuracy were required. In this case the scale should be set so

that the 8-in. mark coincides with the edge of the triangle when the latter is set at 6 on the slide rule, and each reading should be taken 2 in. apart on the scale.

In Fig. 3 is shown the triangle set at the 1-in. mark for the second reading, and shows that the next size above 0.5 in geometric progression would be 0.932. Table III gives the complete series and the approximate fractional sizes.

The last illustration, Fig. 4, indicates the method of calculating a series which has an extreme range that will require the use of the full upper scale with the slide extended. For an example of this kind it is convenient to use a pocket slide rule because it is so short that such a series can be obtained within the range of the ordinary one-foot rule and draftsman's triangle and with a comparatively small-sized guiding block.

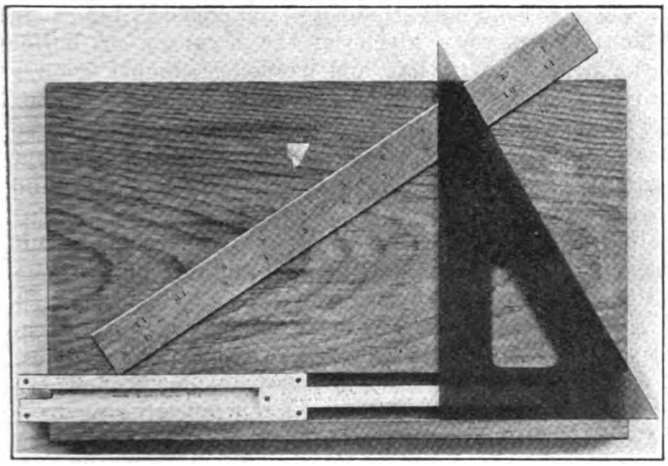


FIG. 4. APPARATUS SET FOR EXTREME VARIATION, USING ALL FOUR OF THE SERIES ON UPPER SCALE AND SLIDE

As an example, obtain a range of numbers from 4 to 10,000, with ten steps, making eleven in the series. Set the end of the steel scale in line with 4 in the first series of the upper scale on the slide rule. Set the triangle at 1, for 10,000, at the extreme right-hand end of the slide on the slide rule when the latter is extended, and swing the steel scale until the 10-in. mark intersects the face of the triangle. Then each inch on the scale will be in a position to indicate the corresponding geometric progression as the triangle is pushed along the block. Fig. 4 shows the setting at the eighth step to be 2,080. Table IV gives the complete series approximately.

TABLE IV. SERIES OF NUMBERS FROM 4 to 10,000
11 Series, 10 Steps

Geometric Progression	Selected Round Numbers	Geometric Progression	Selected Round Number
4.0	4	440	450
8.8	10	960	950
19.2	20	2,080	2,100
41.8	40	4,600	4,600
91.0	90	10,000	10,000
199	200		

An early application of the principle of geometric progression to mechanical work was made in the production of the American or Brown & Sharpe wire gage (designed in 1857 by Lucian Sharpe of the Brown & Sharpe Manufacturing Co.), which had forty-four published sizes ranging from 0.006144 to 0.460. The British Association screw thread standard is also arranged in geometric progression. Series like these can be readily laid out or checked by the methods shown above.

It is believed that an appreciation of the ease with which these methods can be used even by those who are not technically trained would lead to a much more general use of a principle which, when properly applied, will give the fewest numbers in a series to cover the requirements, whatever these may be, and thus secure the most satisfactory results.

The Foreman's Duties

By Robert Grimshaw

The foreman's duties are manifold enough, even when under modern organization methods the functions of each one are limited in number and scope, and delegation of details is carried out in the highest degree compatible with the character of the business and the number and variety of its employees.

The modern tendency—that of functional foremanship—substitutes for the intimate relationship of each foreman to only a comparatively small group of workers, over the members of which he exercises supremacy in connection with all their activities, an entirely different standing. It charges a foreman with a group of duties rather than a group of workers and in that connection may (or may not) have to do with every worker in the place.

Formerly he employed, assigned, and discharged at will, every worker in his group. Now, where the plant is large enough, he employs and discharges none, and assigns few; but in proper understanding with an employment foreman or an employment bureau, accepts what human materials are confided to his direction, seeing to it that their duties in his particular branch—and in no other—are discharged with the greatest possible efficiency, and leaving to various foreman-specialists the duty of determining machine speeds, making repairs, furnishing power, and the like, the realms of these specialists embracing the entire plant.

This principle of division of labor, so long profitably employed in industry, makes for individual efficiency on the part of each of these specialist foremen, and of the workers under him, and contributes to—in fact constitutes—the efficient and economical working of the entire establishment.

Atlanta Entertains the Mechanical Engineers

Important Matters Discussed at Business Meeting—Side Trips to Other Southern Cities Feature of Semi-Annual Convention—Textiles and Power Divide Honors

NO HIGHER tribute could be paid to Atlanta hospitality than to say that its warmth equals that of the city's May weather. The Atlanta section laid itself out to entertain the members of the American Society of Mechanical Engineers and succeeded nobly. The semi-annual convention began with a council meeting on Monday, May 8, and broke up Thursday evening to scatter to Birmingham, Greenville and Muscle Shoals. Some of the members attended a two-day session at Charlottesville, Va., on the way to Atlanta and had a chance to get acquainted with the beautiful campus of the University of Virginia. Joint meetings were held with the Society for the Promotion of Engineering Education.

The main subject before the business meeting on Monday afternoon was the discussion and acceptance of the proposed new constitution of the society. The suggested draft was presented by John L. Harrington, of Kansas City, chairman of the committee on constitution and by-laws.

Revised Version of New Constitution Adopted

President Kimball presided at the meeting which adopted a considerably revised version of the proposed draft after three sweltering hours of argument and parliamentary procedure. A number of minor changes were made and several important ones, notably, the retention of the minimum age limits for members and associate members as given in the old constitution, and the rejection of the provisions in the new constitution for changes in the make-up and terms of office of the council, in favor of the arrangement existing at present. The principal reason for sticking to the old system was the fact that under it a greater aggregate number of years of experience on the council is provided. The new article required a minimum of but sixteen years of total experience while the old article gave twenty-seven. In view of the growth of the society to over 16,000 members and the vital need for providing for an enduring policy extending over a period of years, it was felt unwise to curtail the experiences of the council members.

The next order of business was the report of the joint committee on a code of ethics for engineers. The report was presented by Prof. A. G. Christie, chairman of the joint committee which was composed of members from the societies of mechanical, civil, mining and electrical and heating and ventilating engineers. It was adopted without change.

The hour was then so late that no report from the representative on American Engineering Council was made other than the reading of a telegram stating that Secretary Hughes had announced that the patent treaty with Germany which existed before the war would be renewed.

An added event on the program was a short talk Monday evening by Rear Admiral Fullam, U. S. N., urging support for the development of naval aviation. His talk was illustrated by moving pictures of the bombing of the "Alabama" and the "Ostfriesland."

Tuesday morning was given over to simultaneous sessions on textile machinery in which papers were presented by S. E. Gillespie on cotton-ginning machinery, and by E. H. Marble on maintenance of textile machinery; on materials handling in which F. L. Leach read a paper on material handling machinery as used in the iron and steel industry; on general topics in which papers were given on the accuracy of boiler tests, by Alfred Cotton, and on using exhaust energy in reciprocating engines, by J. Stumpf and C. C. Trump. At the same time there were public hearings on three power test codes; definitions and values, displacement compressors and blowers, hydraulic power plants and their equipment.

In the afternoon there were local excursions about Atlanta, to the famous Stone Mountain and to the Atlantic Steel Company's mills.

A dinner dance at the Ansley Roof Garden on Tuesday evening was the high point in the social activities.

Simultaneous professional sessions on Wednesday morning included presentation of the following papers: "Weaving Machinery," by L. B. Jenckes; "Extraction of Oil from Vegetable Matter," by Jos. Davidson; "Modern Shop Practice in the Building of Revolving Flat Cards," by F. E. Banfield, Jr.; "Reduction of Fuel Wastes in the Steel Industry," by F. G. Cutler; "The Control of Boiler Operation," by E. A. Uehling; "Boiler Room Performance and Practice at Colfax Station, Duquesne Light Co.," by C. W. E. Clarke; "The Muscle Shoals Plant and the Nitrogen Supply," by Maj. J. K. Clement; "Heat Losses from Bare and Covered Wrought Iron Pipe at Temperature up to *800* Deg. F.," by R. H. Heilman; and "The Evaporation of a Liquid into a Gas," by W. K. Lewis.

A real Southern barbecue occupied all hands at noon on Wednesday and those who had ambition enough left followed an exhibition golf foursome over the excellent links of the East Lake Country Club.

The Technical Sessions

More technical sessions followed on Thursday morning. The papers were: "Management Applied to Textile Plants," by George S. Harris; "The Southern Worker—His History and Character," by F. H. Neely; "Power Development in the Southeast," by Chas. G. Adsit; "Economics of Water-Power Development," by C. A. Mees; "Hydroelectric Power-Plant Design," by John A. Sirnit; and "The Report upon Efficiency Tests of a 60,000-kw., Cross-Compound, Triple-Cylinder Steam Turbine," by H. B. Reynolds and W. F. Hovey; "Strength of Electrically Welded Pressure Containers," by R. J. Roark; "Some Principles of the Construction of Unfired Pressure Vessels," by S. W. Miller; "Steel for Forge Welding," by F. N. Speller; and "Tests on Welded Cylinders," by E. A. Fessenden and E. J. Bradford.

The members of the party interested in textile machinery left Thursday night for Greenville, where on Friday they visited the plants of the Duncan Mills, Branden Mills, Judson Mills, American Spinning Co.,

Woodside Mills and Union Bleachery and Finishing Co., the American Cast Iron Pipe Company, Ensley Plant of Tennessee Coal, Iron and Railroad Company, Fairfield Plant of the Tennessee Coal, Iron and Railroad Company.

Those who wanted to inspect steel mills and power plants went to Birmingham on Friday and visited the plants of the American Cast Iron and Railroad Co. On Saturday they inspected the Wilson Dam and the government nitrate plants at Muscle Shoals.

Romances of Metal Working—Saint Eligius the Metal Worker

By H. H. Manchester

In Saint Eligius, we come at least to an historic character, though some of the legends concerning him stretch the belief of the present day.

He was born near Limoges in France at the end of the 6th century A. D., and, when a boy, was apprenticed for seven years to the goldsmith Abbo, master of the mint there. After acquiring considerable skill in metal working, he went to Paris as a journeyman and began to work for Bibo, who was treasurer for Clothair II.

Not long after this Clothair ordered a new throne, and for this purpose put into Saint Eligius' hands the gold and other precious materials for the purpose. From this Saint Eligius produced a wonderful golden throne, heavily engraved and ornamented. Clothair was so pleased that he asked Saint Eligius what reward he desired. For answer Saint Eligius brought to him a second golden throne which he had produced from the materials left over from the first. Clothair was so struck with his honesty that he at once made him master of the mint. After Clothair's death Saint Eligius continued to hold this office under Dagobert.

At first Saint Eligius dressed outwardly as the others, in fine raiment ornamented with gold and jewels, but with sackcloth next to his skin. Later he sold his jewels, gave to the poor, and dressed as a monk. In fact he founded an important monastery in Limousin. He was made Bishop of Noyon in 640 A. D.

All this time he was busy making shrines for the relics of the saints, as well as vessels for the churches, and he became very skillful not only in manipulation of the precious metals, but of iron and bronze. He was supposed to have acquired all of the secrets of metal working, and to have made many improvements.

Some of the mediaeval pictures of his shop represent the drawing of wire there by main strength through a draw plate. This invention used to be ascribed to Rudolf of Nuernberg, but as we know it was in use long before, it may have gone back to Saint Eligius.

He is also represented in art as shoeing a horse, having the horse's leg or foot in his hand. This is in commemoration of a mediaeval myth which was told, not only about Saint Eligius, but with variations concerning several of the other saints. There was at the time a blacksmith who knew something of black magic, and had put a sign over his shop in which he boasted that he was master of all master smiths. One day, however, when Saint Eligius was passing by, he found the blacksmith having great trouble in shoeing a very refractory horse, and swearing mightily over the job. Saint Eligius stepped up and offered to do the work unassisted, to which the smith assented with a doubting laugh. The saint thereupon took off one of the feet of the horse, nailed on the shoe and put the foot back on again, the horse meantime standing contentedly by. Then Saint Eligius repeated the operation until all the hoofs were shod. While the smith was astonished he was enough of a wizard himself not to be nonplussed. "Well," he admitted, "that's a mighty good notion; I'll do it myself." He actually tried it on the next horse. Of course he could not put the leg back on again, and before Saint Eligius would do it himself, the smith had to promise to be converted.

ST. ELIGIUS SHOES THE HORSE

Wildly impossible as this superstition is, such mixtures of fact and fancy are highly typical of the legends that gathered about even historic characters in the Middle Ages.

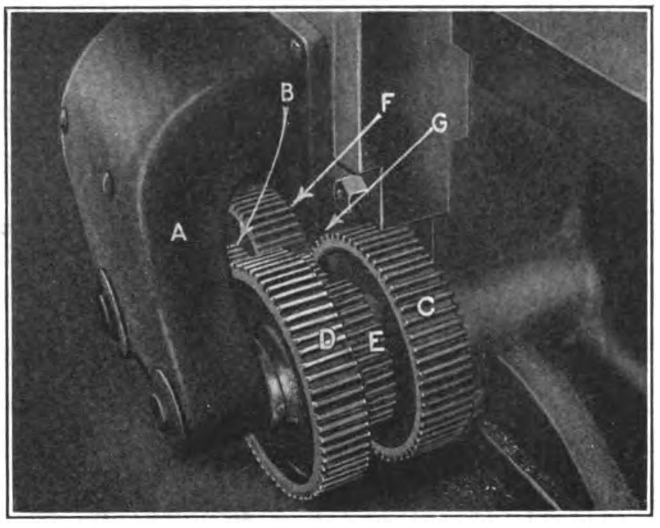
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Speeding Up an Old Planer

By Milton Wright

We had an old 42-in. planer, built many years ago by Mark Flather, Nashua, N. H., the table speed of which was altogether too slow to keep up with the trend



TRIPLE GEAR REDUCTION ON A PLANER

of modern times. We desired to increase it so that we could use high-speed tools to advantage.

Speeding up a planer would seem at first glance to be a matter of belts and pulleys, but in this case there was a limiting factor that had to be considered. This planer was designed for a table speed of 20 ft. per minute and in the place of the nest of gears shown in the illustration, there was the usual single reduction, with a very small pinion on the first shaft and a very large gear on the second.

Even at an additional 10 ft. per minute these gears made trouble and the planer threatened to jump off the floor at each reversal. The shafts were therefore taken out and longer ones substituted, the bracket *A* made, and the "triple back gear" reduction put in place as the illustration shows.

The pinion *B*, only one or two teeth of which are visible in the picture, is keyed to the first shaft, the latter extending far enough beyond it to take a bearing in the bracket. Gear *C* is keyed to the second shaft, upon which (inside the bed) is the pinion that meshes with the bull wheel.

Gear *D* and pinion *E* are doweled securely together upon a substantial bushing which turns freely upon the second shaft. Gear *F* and pinion *G* (the latter not visible in the picture) are similarly mounted upon a bushing that floats upon the first shaft. Generous oil-holes and channels are provided to conduct lubricant to the various bearings.

The drive may easily be traced by the letters. Pinion *B* drives gear *D* and with it pinion *E*, pinion *E* drives *F* and *G*, and *G* drives gear *C* on the second shaft, thus constituting a triple reduction where before there was but a single one.

The speed of the countershaft was brought up to the requisite limit by suitable pulleys, though not in proportion to the increased table speed, as the pinion *B* is considerably larger than the one it replaced. The table now travels 50 ft. per minute with less shock at reversal than resulted from the original slow speed.

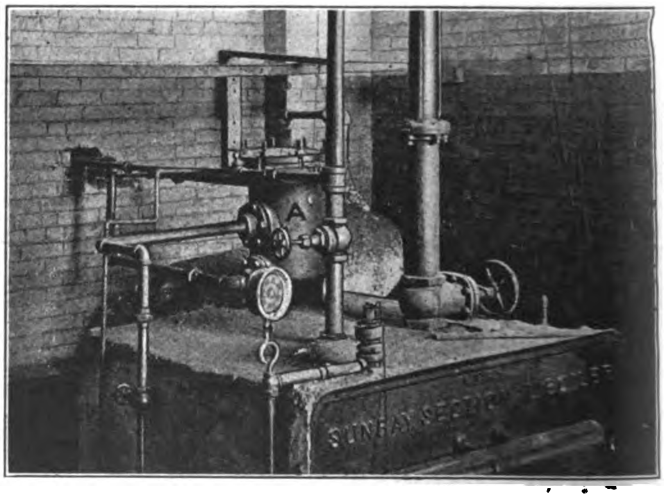
Keeping a Service Tank from Freezing

By Amos Ferber

The illustration shows a simple expedient which we adopted to prevent the water in the service tank, on the roof of the factory, from freezing.

Up to two years ago there had been a pipe for admitting live steam directly from the boiler to the tank, and when the fireman did not forget to turn on the steam this worked very well. Sometimes he forgot and then there was trouble. There was a lot of steam wasted anyway.

The device shown at *A* is an old heater, similar to a feed water heater, that had been lying around in some odd corner for a long time, out of service. Our superintendent conceived the idea of setting it up on top of



WATER HEATER FOR SERVICE TANK

the heating boiler, as shown, connecting the coil both top and bottom to the boiler so as to keep a circulation in the coil, and connecting the inlet and outlet to the tank by means of two pipes, one of which should enter the bottom and the other near the top as in the ordinary form of water heating systems.

The device has now been in service for two winters and the tank has not frozen since it was installed. There is nothing to forget as the valves are always open and consequently there is always a current of warm

water ascending to the tank. The cost of installation was but a few hours' work and the cost of operation is so low as to be negligible.

Milling Tapered Wedge Keys with an Automatic Hacksawing Machine

By Harry Flower

Our products call for a great number of tapered wedge keys that are made from $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{5}{8}$-in. round cold-rolled steel. These keys, which are used to hold a collar onto a crankshaft, are 2 to 3 in. long and have a flat milled the whole length of one side, as shown in Fig. 1. We had been milling the tapered flat on these keys with a milling machine, but had been having considerable difficulty in keeping up the holding fixtures, due to the fact that it took such a tremendous strain to hold the pin and keep it from turning under the

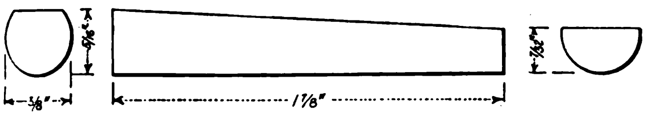


FIG. 1. DIMENSIONS OF KEY

milling cutters that the holding fixture would not stand up very long.

Our superintendent, getting hot about the collar as a result of the tremendous expense of keeping up the holding fixture, hit upon the idea of milling the keys with a hacksawing machine, using a staggered tooth broach in place of a hacksaw blade. He rigged up a No. 5 Marvel automatic high-speed saw for the purpose, and the machine has been running day after day making these keys automatically without any attention whatever from an operator except for the purpose of reloading the magazine.

Front and rear views of the machine in operation are shown in Figs. 2 and 3. The saw frame was cut down to hold a heavy broach $\frac{3}{4}$ in. wide. The broach or cutting tool was made with teeth on both sides so that when one side became dull the tool could be reversed.

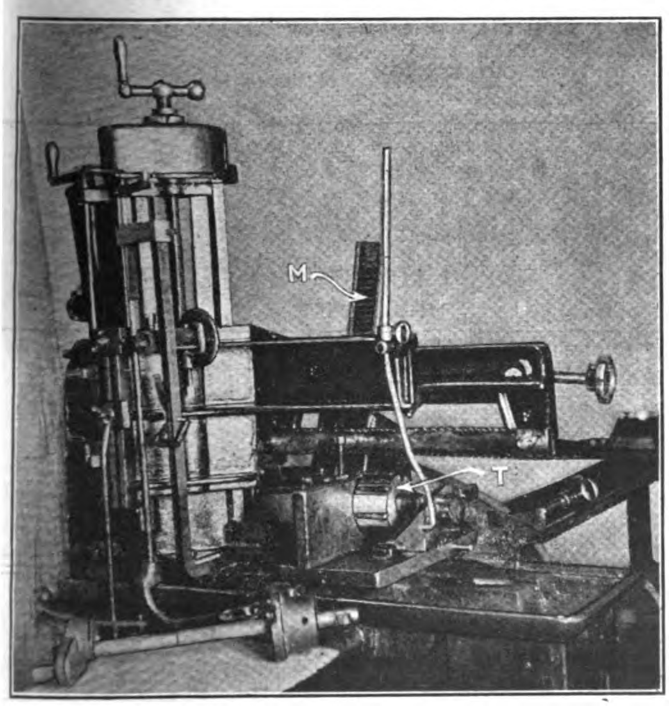


FIG. 2. FRONT VIEW OF MACHINE

A turret *T* was mounted on an angle plate which was clamped to the machine bed in place of the regular vise, and the turret drilled at six equidistant points near the circumference to receive six blank pins. The angle plate was machined at the same angle as the required taper on the key. A ratchet *R* attached to the outer end of the turret shaft was so placed that a pawl *P* actuated by the regular vise lifting rod would turn the turret one-sixth of a revolution and register a blank pin directly below the cutting tool each time the saw

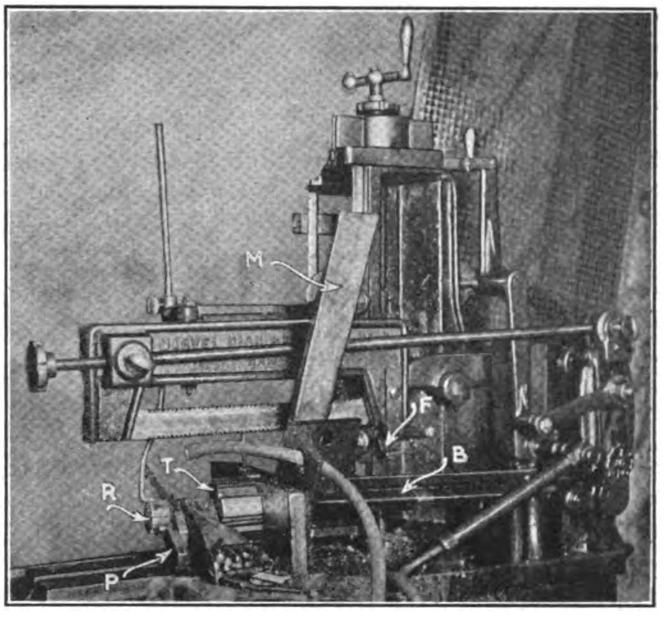


FIG. 3. REAR VIEW OF MACHINE

frame was automatically raised to the top or starting position.

A sheet metal trough *M* was provided as a magazine to hold a number of blank pins. A round rod with two trip dogs attached to it was supported so that it could slide endwise back of the horizontal bracket *B*. When the saw frame comes down to mill the key that is in position below it in the turret, the finger *F* on the rear of the saw frame strikes one of the dogs on the slide rod on the forward motion of the saw frame, driving the rod forward, and pushing the lower blank pin from the magazine into the turret, at the same time discharging a finished key. The return of the saw frame allows finger *F* to engage the other dog on the slide rod and pull the slide or loading rod back toward the rear of the machine to its original position.

How to Find the Area of an Irregular Surface

By Frank Harazim

To find the area of a plane surface of an irregular outline, place the object under a sheet of transparent paper cross-sectioned in $\frac{1}{8}$-in. squares and tack the sheet to the board. Count the number of whole squares that are within the outline; then estimate the fractional parts of the squares cut by the outline and add their sum to the number of whole squares. The result is the area in units of the dimensions of the squares. The smaller the squares of the cross-section paper the more accurate the result. This is not a new method, but needs to be mentioned frequently.

A Rotary Box-Blank Die

By P. H. White

The rotary die herein described is used in cutting blanks from which cardboard boxes are made. The stock used is of different thicknesses, varying from 0.035 to 0.065 in. and comes to the cutting machine in reels weighing on an average 400 lb. The reel of cardboard is mounted on a standard at the rear of the cutting machine, and the end of the roll is started into the machine. The feeding is done by two rollers, the upper one also doing the cutting. The rolls are of the same diameter, and are driven at the same speed by means of a pair of gears having a pitch diameter equal to the diameter of the rolls.

In Fig. 1 is shown the appearance of the blank when it leaves the machine. The score lines *AA* and *CC* are cut through half the thickness of the stock, and determine the width of the box. The score lines *AB*, *AC* and *CD* determine the length of the box. Fig. 2 represents the finished box when folded and pasted together. Fig. 3 shows an assembly of the finished die. The knurling shown is to prevent the cardboard from creeping.

The different parts that go to make up the die are held in place by means of two nuts, shown in Fig. 4. These nuts are made right- and left-hand, so that any slipping between the top and bottom rolls will tend to tighten the nuts. Another function of the nuts is to act as safety rings for the purpose of preventing the two rolls being adjusted too closely together and thus injuring the cutting blades. The diameter of the nuts is made greater than that of the rolls, but smaller than the outside diameter of the circular cutters.

The circular cutters are represented in Fig. 5. The score line *AA*, Fig. 1, is cut by the undercut portion of *A*, Fig. 5, while the portion from the lines *AC* to the ends is cut by the full sized part of the cutter. Cutters *B* and *C* cut out the small portions along the lines *G* and *H*, while *D* trims the outside edges along the lines *BB* and *DD*. It should be noted that there are two of each of these cutters, making eight in all. In machining with cutters *B* and *C*, it is necessary to transfer the cutting edges from front to back at the points where they start to cut out the radii at *A*, *B*, *C* and *D*, Fig. 1. Cutters *B* and *C*, it should be noted, are relieved sufficiently to clear the blank except at the lines *G* and *H*.

In Fig. 6 *A* represents the blades which cut off the ends of the blank. *B* represents the blades which make the cross scoring lines. The blades are held in their respective slots by means of wedges, as shown at *C*.

The blades are carried in the holding rings shown in Figs. 7 and 8. The wedges have $\frac{1}{32}$ in. clearance underneath to insure their binding against the blades rather than resting on the bottoms of the slots.

The narrow ring shown in Fig. 9 carries a short blade similar to *A*, Fig. 6. One of these rings goes at each end just inside of the nut. The function of these blades is to cut up the narrow strip trimmed from the width of the stock as it passes through the rolls. When this narrow strip is not cut up, it sometimes runs out in long lengths which become objectionable.

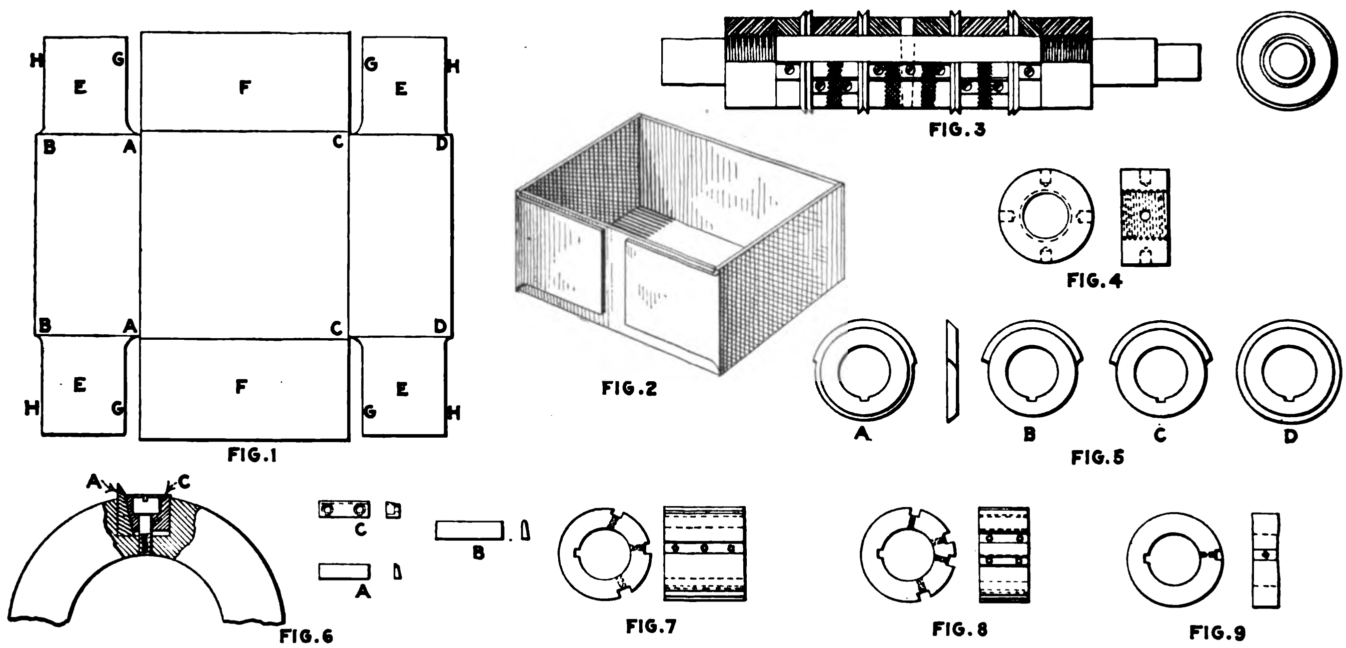


FIG. 1. THE BOX BLANK. FIG. 2. THE FOLDED BOX. FIG. 3. THE ROTARY DIE. FIG. 4. THE END NUT. FIG. 5. THE CIRCULAR CUTTERS. FIG. 6. CUT-OFF BLADES AND WEDGE. FIGS. 7 TO 9. RINGS FOR HOLDING CUT-OFF BLADES

Rebabbitting Bronze-backed Bearings with a Soldering Copper

By Robert Tait

I have read with interest the items appearing in American Machinist from time to time dealing with automotive repairs, as we do a large amount of such work.

One job, which is of frequent recurrence is the rebabbitting of bronze-backed bearings. We had tried many ways of doing this with rather indifferent success until we hit upon the following plan. Using a piece of angle iron as a mold, a quantity of babbitt bars of a convenient size are cast. The bronze shells are carefully cleaned and retinned if necessary and the babbitt applied with a soldering copper, until sufficient metal is built up to admit of boring to size. We have used this method for a good while and have yet to hear

of a bearing in which the babbitt has broken away from the bronze.

In the case of connecting rods, which are tinned directly on the steel forgings without the use of a bronze shell, the same procedure as above is used; after which we locate the rods by the piston-pin hole on an angle plate attached to a milling machine table, and bore and face with an adjustable boring bar in the usual manner.

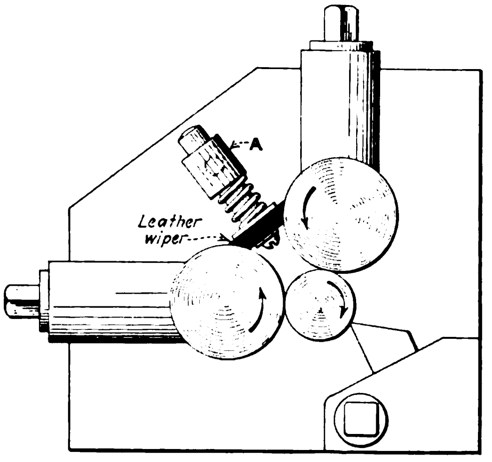
This idea may not be new to most of your readers, but it has proved of value to us, and we are glad to pass it along for consideration.

A Cleaner for the Rollers of Box Tools

By W. Burr Bennett

We had been having trouble in our shop from chips that would cling to the rollers of the box tools and mar the work, especially when the material was cast iron. To overcome the trouble the writer devised the roller cleaner shown in the sketch.

The square shouldered stud *A* screws into the face



WIPER FOR ROLLERS OF BOX TOOL

of the box tool. Fitted to the crosshole in the outer end of the stud is the stem of a plunger to the outer face of which is attached a leather wiper to bear upon the rollers, it being held in contact therewith by the pressure of a coil spring surrounding the stem of the plunger.

It was first feared that the pressure of the wiper upon the rollers would prevent the latter from revolving and thus cause flat spots to be worn upon them, but this fear proved groundless. The pressure of the work is so many times greater than that of the wiper that the rollers always revolve.

Different sizes of leather have to be provided to accommodate different settings of the tool.

What Is the Most Economical Belt?

By S. Kelly

The article by W. F. Schaphorst under the above title, printed on page 256 of American Machinist, is a timely and instructive one upon a subject to which too little attention is ordinarily given. His handling of the matter would indicate that he had had a lot to do with belts and that he does not share in the general indifference accorded to the belt subject.

Belts running upon smooth surfaced pulleys of either metal, wood, or paper are by no means positive in their action. Unless the belt is unduly tight there will be slippage and consequent loss of power; or, if the belt be sufficiently tight to prevent slippage, there will be excessive friction upon the shaft journals. Since 90 per cent of the power transmitted in this country is by belt, the total loss is enormous.

A very simple and efficient means of overcoming the difficulty and reducing the power loss from slipping belts is to cover all pulleys with a heavy cotton fabric fastened to the surface with cement. If this job is neatly done the pulley surface will present a smooth, unbroken appearance and its balance will not be affected.

The belt shows a tendency to cling to the surface of a pulley so treated much more tenaciously than to the original surface and therefore a belt that would otherwise have to be very tight in order to transmit its quota of power may be run quite slack, with a corresponding lessening of friction upon the bearings.

The power transmitting capacity of pulleys so treated ranges from 30 to 70 per cent greater than that of the same pulleys under the same conditions of speed, width, tension, etc. with uncovered surfaces, and the life of a belt may be increased from 50 to 500 per cent.

A concrete illustration of the possible saving may be drawn from the following example: A steel saw in a structural shop was driven by a 16-in. belt running upon uncovered pulley surfaces. This belt slipped excessively and so rapid was the wear that a belt would last only from 40 to 60 days. The pulleys were covered as above described and the new belt then placed on the drives has now been running for 18 months.

Clearance Grooves for Sliding Fixtures

By E. F. Oakford

In the article on "Tool Engineering" on page 798, Vol. 55, of American Machinist, there is illustrated (Fig. 255) a sliding fixture in which the clearance at the corners of the guiding strips is obtained by grooves as shown at *A* in Fig. 1.

Such a crude method of obtaining this most necessary clearance deserves the strongest condemnation. The extra cost of machining these grooves is considerable, usually needing a change of tools and always requiring increased time and labor. A more reasonable method of obtaining such clearance is shown in Figs. 2 and 3. The fitting is machined, as in Fig. 3, to leave the corners as sharp as is convenient, using ordinary tools, while the edges of the guiding strips, Fig. 2, are machined to a radius appreciably larger than that of the female portion. When assembled, an entirely satisfactory clearance is secured, combined with maximum cheapness and ease of production.

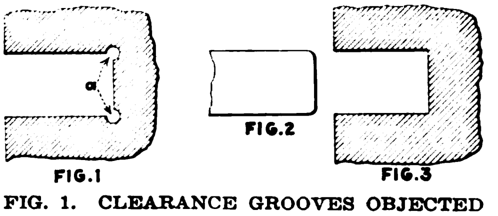


FIG. 1. CLEARANCE GROOVES OBJECTED TO BY THE AUTHOR. FIGS. 2 AND 3. CLEARANCES OBTAINED BY ROUNDING CORNERS OF THE TONGUE

It should be noted that the method of securing this clearance, as shown in the article referred to, cannot be adapted conveniently to any milling process, though such a process can be used for the modified method described here.

Editorial

Conservatism of the Mechanical Engineers

THE members of the American Society of Mechanical Engineers have decided to make haste slowly. At the Atlanta meeting last week where the draft of the new constitution was presented for discussion they decided that it was all-important to provide every safeguard for a continuing policy.

According to the changes in the new constitution affecting the council of the society, the total years of service of those members holding over at each election would have been a minimum of sixteen. Under the existing arrangement this minimum is twenty-seven.

With a membership sixteen thousand strong and still growing, and with an annual business running over six hundred thousand dollars, it is wise for any group of men to take steps to prevent sudden shifts of policy due to rapid changes in the directorate.

There is, of course, the danger of reactionary tendencies in men too long in office but with approximately one third of the council members being replaced every year this danger seems much less than the other.

We feel that the Mechanical Engineers are to be congratulated on their sound judgment. They are on the eve of accomplishing big things and need a well-balanced fly wheel to hold them steady.

Standardization Through Trade Associations

ACTIVE work on the standardization of products throughout industry in general probably began during the late war when the Conservation Division of the War Industries Board asked each concern and each industry to co-operate in the elimination of unnecessary lines. The advantages incident to standardization of products and elimination of unnecessary designs are self-evident. Very frequently, however, the means of obtaining them are not so evident.

Of course, any one concern can standardize within its own organization, but the greatest work has been accomplished by trade associations that represent a whole industry or branch of one. Because of their work on standardization, trade associations are now receiving much attention and favorable comment from the Department of Commerce. Most of this work relates rather to simplification of variety, than to standardization as based on engineering principles.

The machine industry can learn from what has been done in related industries, and even in those that are far removed from it. The fact that an association representing the manufacturers of over 90 per cent of the output of farm implements in this country has been able to eliminate 955 models of farm machinery and to retain only 137, is very significant of the possibilities in this line.

If a manufacturer of writing paper can save hundreds of thousands of dollars a year by simplication in the variety of his products, and if a fertilizer manufacturer can cut the number of formulas used to only a fractional part of those formerly employed, there is certainly opportunity for similar work in the machine industry, where so much detail is involved. Common building brick, umbrellas, wood wheels and numerous other products have been standardized by the active influence of trade associations, and the work is so new that the biggest developments are still to be expected.

The idea of elimination of the unnecessary items and concentration on the important ones is so well worth developing that it might almost be taken as the motto of trade associations. The results accomplished have been so favorable and the saving for every one concerned so marked, that the work deserves the attention of every manufacturer. Time and money put into intelligent standardization will pay big dividends in the end.

Care in Starting Idle Machines

BUSINESS is picking up—and it is bringing its problems to machine tool builders and others. One of these has to do with the starting up of machinery that has been standing idle for some time. Of great importance is the matter of thorough lubrication. It is many times equally important to remove old oil.

In one specific instance that has come to our notice, a machine had been delivered two years ago but had never been run owing to lack of orders. On starting it up one of the main bearings had seized and the users demanded, through the agent, the replacing of the shaft and bearing without cost.

It hardly requires a Sherlock Holmes to determine why the bearing seized. Oil in bearings does not remain a good lubricant after standing idle for two years. In all probability it forms a residue or gum which takes up most of the space provided for the film of lubricating oil. This gum is not a lubricant but makes a highly frictional surface. Oil, even if introduced into the bearing, could hardly lubricate it properly under these circumstances. Such a bearing is almost certain to seize when put to work.

When a machine has been standing idle for any length of time, the lubrication of its bearings becomes a problem requiring careful attention. The whole lubricating system, if it has one, should be not only drained but thoroughly flushed out with kerosene to cut out any gum which may have accumulated. Care should be taken that every bearing is free to move and that it has a good supply of new lubricant.

It is a good plan to turn over by hand a machine which has been standing idle to make sure that it is free in every bearing. If it turns freely, run it by power but without load, until you are convinced that it is all right to put to work. A little precaution of this kind will save time, trouble and a tendency to dispute with the maker as to the machine's being defective.

Now is the time for builders of machine tools to be on their guard for claims for replacements due to the cause mentioned. Now is the time for users of machinery to use good judgment in starting up machinery so as to avoid unnecessary and exasperating delays.

Shop Equipment News

Bright Internal Grinding Machine

An internal grinding machine of unique design has recently been placed on the market by the Garvin Machine Co., New York, N. Y. The machine is the invention of Fred E. Bright, who is well known in the machine industry in both this and European countries. It is intended primarily for manufacturing operations; it grinds cylindrical holes only. A view of the control side is shown in Fig. 1, and of the back of the machine in Fig. 2.

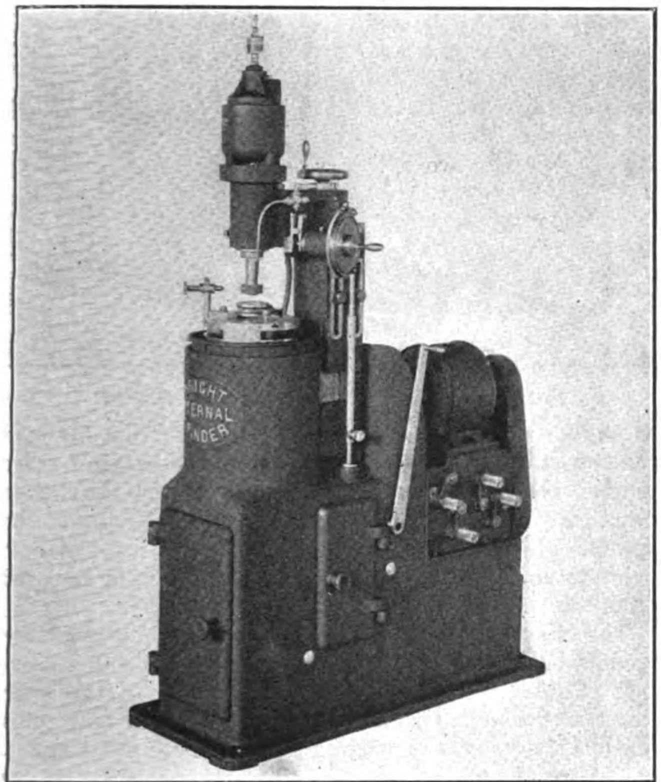


FIG. 1. BRIGHT INTERNAL GRINDING MACHINE

The new fundamental feature (patented in many countries) is the revolving and reciprocating of the work carrying spindle in one bearing, eliminating the necessity for exact alignment of it with other essential parts of the machine. Due to this fact great accuracy and efficiency are possible in the finishing of straight round holes.

The grinding wheel spindle is directly driven, so that slowing down due to belt slippage is avoided, and the wheel speed can be continuously and accurately maintained. Other features such as the simplicity of control and the accessibility of the work, are certainly worthy of note.

Both the wheel spindle and the work spindle are placed vertically. The motor driving wheel is at the top of the machine; a separate motor, located at the rear, is provided to drive the work and to operate the feed mechanism. The capacity of the No. 2 machine is rated as 4 x 4 in. A swing of 11 in. is permissible inside the water guard, the latter a simple, adequate part of the machine.

Because of the vertical position of the spindle, the floor space required is considerably less than that of a horizontal-spindle machine of like capacity. Since the machine is self-contained, no belts nor countershafts are required. This reduces the cost of maintenance and allows the easy removal of the machine from one spot to another. The floor space is only 20 x 45 in. The machine is 63 in. in height, with the wheelhead in the raised position; the chuck plate is $38\frac{1}{16}$ in. above the floor in its central position. The total weight of the machine is only 1,250 lb., but is said to be unusually rigid and substantial for its range of work.

The motor driving the wheel spindle is of the induction type, and easily removable from the housing of the spindle. The absence of brushes enables rotation at a very high speed. Although the motor generates $1\frac{1}{2}$ hp., the outside diameter of its housing is only $5\frac{3}{4}$ in. The windings are cooled by a draft of air taken in at the bottom of the housing and expelled at the top. The armature shaft runs on one double-row ball bearing at the top.

The wheel spindle is mounted in double-row ball bearings, one at the top and one at the bottom. These bearings are adjustable to provide for taking up wear. At the bottom of the spindle, extensions to suit the type of work being done can be mounted. The arm-

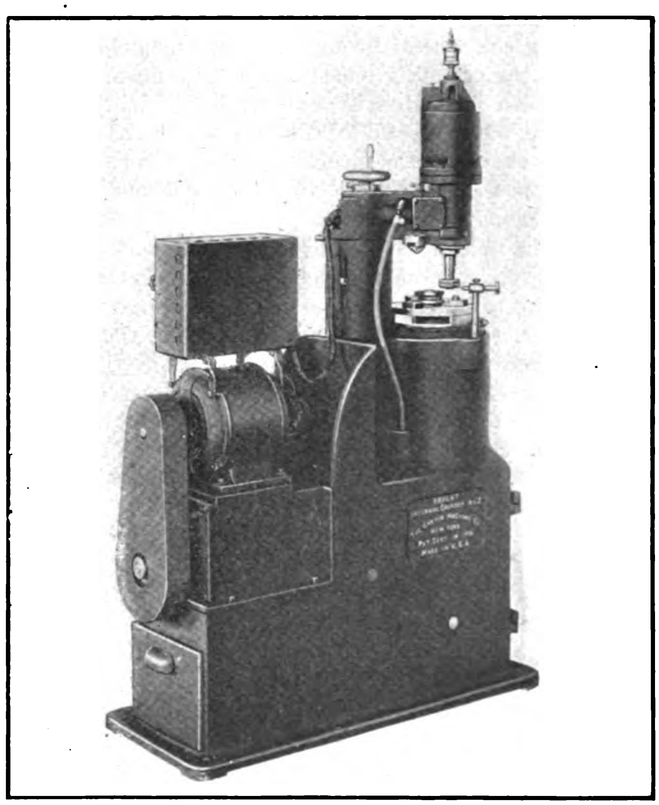


FIG. 2. REAR VIEW OF BRIGHT MACHINE

ature shaft drives the wheel spindle through a tongue-and-groove coupling. Thus, when in operation, the two shafts rotate as a unit on three ball bearings. No vibration is perceptible due to the rotation of the parts.

The oil from the cup at the top of the head drips down so as to lubricate the top bearing of the armature. It is prevented from entering the windings of the motor, and is carried through a duct to the bearings of the wheel spindle.

In order to change the speed of the wheel spindle, the frequency of the current driving the motor must be changed. The frequency-changing device ordinarily employed consists essentially of a variable-speed d.c. motor driving an alternator. It is thus possible, by merely changing the resistance in the field circuit of the d.c. motor, to vary the number of cycles, and consequently the speed of the spindle motor. At 120 cycles, or the minimum speed, the spindle motor runs at 7,500 r.p.m.; at 200 cycles, the speed is 12,000 r.p.m., which is the maximum, these and intermediate speeds proving to be effective because of their maintenance at predetermined rate without slippage. Where a single grinding machine is used, a small frequency changing unit may be employed. Where a battery of the machines is operated, one installation may serve for the entire group.

The wheel spindle and its motor are mounted on a yoke that pivots about the supporting column. This column can be lifted by means of a lever at the right side of the machine, so that the wheel clears the work. After the wheel has been raised, the whole head can be swung to the left of the machine, so as to provide clearance for removal and replacement of the work. The column consists of two telescoping parts, whose relative position is controlled by means of a screw operated by the handwheel at the top. It is thus possible to vary the length of the column, and, consequently, the height of the wheelhead.

A feed screw having a large graduated wheel is carried on the column at the right of the wheel spindle. By turning the wheel through one space marked on its periphery, the grinding wheel is fed a distance of 0.0001 in. The feed is ordinarily automatically operated. It takes place at each end of the stroke, so as to wear the wheel evenly. An automatic stop is provided, so that it is possible to work to depth without constant attention from the operator.

When the wheel is swung over the work, a block strikes the end of the feed screw, which has a spring-loaded point, in order to cushion the shock. As the head is lowered to bring the wheel inside the work, a spring-loaded yoke passes behind a pin in the screw. This yoke keeps the screw and the block pressed against each other, so that the wheel may be brought to the same position each time that it is swung over the work. As soon as the head is lifted, the yoke disengages, thus permitting the operator to swing the head by the pressure of his left hand away from the work and against the stop provided to limit the swing.

A diamond is fixed on the housing of the work-holding chuck, so that the abrasive wheel can be dressed by merely lowering the head when it is against the outer stop. A screw adjustment is provided for moving the diamond forward as the wheel wears down.

The chuck or fixture holding the work is mounted at the top of a hardened steel spindle 3 in. in diameter and 20 in. long, that is carried in two phosphor-bronze bearings fixed in a housing that can be easily removed. Due to the vertical position of the spindle, it revolves in a perfectly balanced film of oil in each bearing. The only time when there is any lateral pressure is when the grinding wheel touches the work. This force is

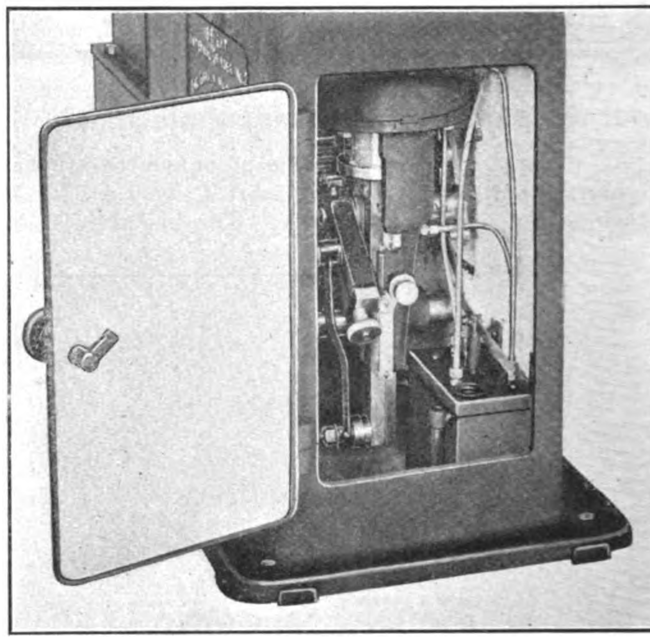


FIG. 3. STROKE ADJUSTING MECHANISM

so slight that it does not squeeze the oil from between the two surfaces. Since the metal of the bearing never touches that of the spindle, the life of the bearing is practically unlimited. The reason for making the spindle of hardened steel is to prevent injury to it prior to assemblage, or in the event that it is removed from the machine.

The chief feature, previously mentioned, is that the spindle both rotates and reciprocates in the same bearing. Consequently, the work reciprocates in the same line about which it rotates. Since the wheel maintains one position only, a straight and round bore must result.

The weight of the spindle and work is carried on one $\frac{3}{4}$-in. ball at the bottom. This ball rests in a small pocket that allows sufficient clearance for it to travel eccentrically about the center line of the spindle, so that it wears uniformly. Removable hardened steel disks are provided both above and below the ball.

The spindle is driven by means of three flexible steel keys, mounted in a bevel gear running on a separate bearing with clearance around the lower end of the spindle. As the spindle reciprocates, these keys slide in vertical splines. The advantage of this method of drive is that no side pressure is placed on the spindle, as must necessarily occur when it is driven by means of a belt. The bevel gear is mounted on ball bearings and is driven by a pinion carried on a shaft, also running in ball bearings, and connected directly to the speed-change gear box at the rear of the machine.

The work spindle is lubricated by force feed from the small pump, Fig. 3, placed in the front of the base and driven by the stroke mechanism. The oil is driven to the top of the top bearing, and works down through the two bearings to the bottom of the spindle, where it drops off into a small cup, from which it is led back to the tank of the oil pump. Some of the oil is diverted to the bevel gears, so that both they and their bearings run in oil.

The mechanism that causes the work spindle to recip-

rocate is driven by a separate shaft from the feed box at the rear of the machine. This shaft drives a cam through a worm and worm gear. The purpose of the cam is to so operate a lever and a connecting rod fastened to the bottom of the shaft carrying the ball which supports the spindle, that the spindle will move at uniform speed from one end of its travel to the other, or at a variable speed according to the form given the cam. The stroke of the spindle can be controlled from nothing up to the maximum while the machine is running, by merely turning a small knurled screw. Fig. 3 shows the mechanism by which reciprocation is controlled.

By the use of both a double and a single-lobe cam on the camshaft, twice the number of reciprocating movements provided for by the feed box can be obtained. Of course, only one cam is in operation at a time. The speed of rotation of the spindle is 100 to 385 r.p.m., in five steps. The ten reciprocating speeds permit of from 4 to 48 strokes per minute.

The total weight of the reciprocating parts is balanced by means of a counterweight inside the base. However, the spindle is slightly heavier than the counterweight, so that it drops of its own accord and keeps the follower against the cam. The motion of the cam follower is only one-third that of the spindle.

By the removal of two bars that pass through the base, the entire mechanism for operating and controlling both the rotating and reciprocating action of the work spindle can be removed as a unit through the door in the front of the base.

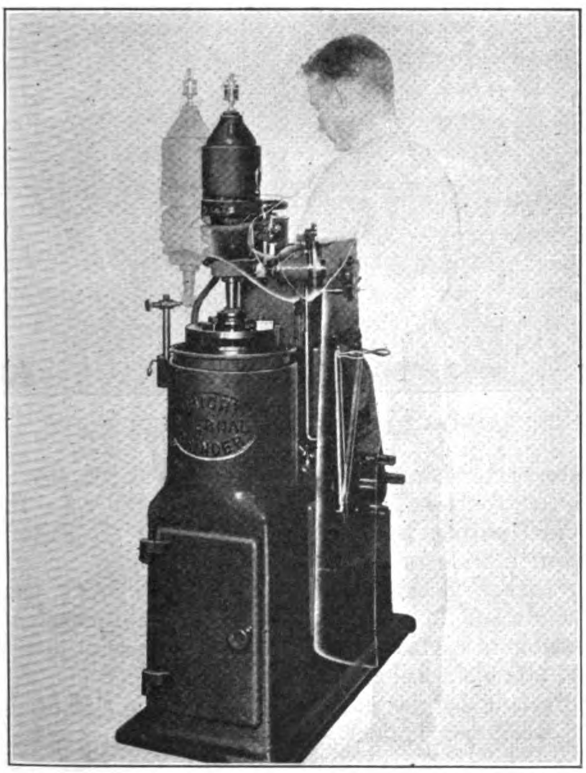


FIG. 4. POSITIONS OF HEAD AND OPERATOR

The 1½-hp. motor at the rear of the machine drives by means of an inclosed silent chain the feed box on which it is mounted. This feed box is of the automobile type, and has three shafts in each compartment. It really is two separate boxes, the upper one driving the mechanism for rotating the spindle, and the lower one that for reciprocating it. Five changes of speed operated by two hand levers are provided in each box. All gear-box shafts are mounted on ball bearings, and no gears are in mesh when not actually driving. The gears run in oil. A brake is provided at the rear end of the main drive shaft, so as to stop the motion of the work spindle as soon as the wheel is lifted from the work.

The rear of the base contains a tank for holding the cutting lubricant, as well as a pump for circulating it to the nozzle at the head. The piping is inclosed and the water tank is easily removable for inspection and cleaning. When the wheel is lowered to the work to start the cut, the cooling lubricant is automatically turned on, and it is turned off when the work spindle is withdrawn.

The guard surrounding the work chuck can be easily raised and lowered by the operator. The water thrown from the work runs down on the inside of it, but it is prevented from entering the bearings of the work spindle by a cylindrical brass guard secured to the bottom of the chuck plate. The water and grit thus pass between the two guards and into an annular chamber in the housing, the bottom of which chamber slants to one side of the machine, where a drain leads directly to the tank in the base.

To start the machine, the lever on the right is pushed backward. This action first lowers the wheel to the work. Continued movement of the lever disengages the brake mechanism and engages the clutch at the feed box. When stopping the machine, the forward movement of the lever throws out the clutch, engages the brake and then raises the head.

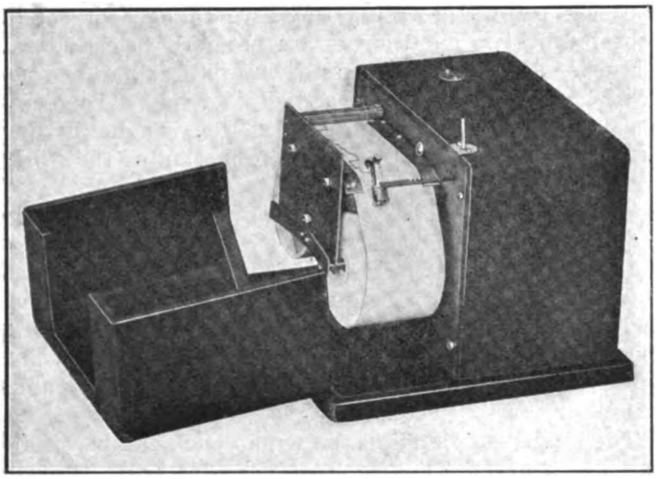
The work is in plain view and very easily accessible to the operator, whose position for operating the various movements is shown in Fig. 4. In order to dress the wheel, vertical reciprocating movement is given it by operating the lever back and forth at the front end of its stroke. The work spindle does not rotate nor reciprocate during this operation.

Williams Time-Study Machine

H. H. Williams, 1613 Chestnut St., Philadelphia, Pa., has recently placed on the market a machine for use when taking observations in time-study work. The machine times the operations and makes a permanent record. The illustration shows the machine with the cover at the rear of it removed, so that the recording mechanism can be seen.

A strip of paper is moved by a positive drive at a uniform rate of speed that can be regulated to suit the conditions. A pen is so mounted as to trace a line on the moving strip of paper. This pen is caused to move back and forth across the strip by two finger keys. The observer presses one of the keys at the completion of each element of the cycle during an observation, so that the pen moves by steps across the strip. At the end of the cycle, the pen is returned to its starting position by pressure on the other key. It is thus not necessary for the observer to give close attention to the machine, and he can keep his eyes on the worker continuously, so as to observe his movements in performing an operation.

The graph or record that is obtained gives all the data necessary for filling in a time-study observation sheet of the usual type. The data in the record on the strip can be transferred to such a sheet at the con-



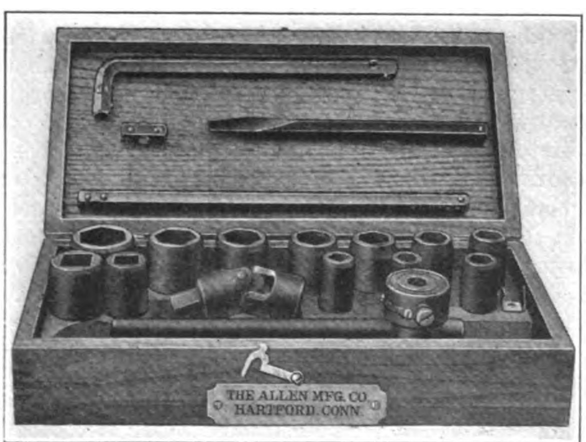
WILLIAMS TIME-STUDY MACHINE

venience of the observer. The length of time elapsing between each step or jump of the pen can be read on the strip by means of a decimally divided scale when determining the time of each movement.

The motor is spring-driven clock work, and is sturdy enough to give continuous operation. Since the machine is not dependable on any outside power, it can be easily moved to any desired position. The machine is more accurate than a stop watch, as observations of 0.001 min. can be recorded. Twenty-four steps or elements are obtainable on the moving strip of paper. The machine is 8 x 8 in. square and $6\frac{1}{2}$ in. high. It weighs $9\frac{1}{2}$ lb., so that it can be very easily carried to the place where it is to be used.

Allen "Bay State" Wrench Set

The Allen Manufacturing Co., Hartford, Conn., has placed on the market a set of square and hexagon socket wrenches designed expressly for automobile and garage work. The set comprises reversible ratchet wrench, universal joint, extension bar, screwdriver and twelve sockets ranging in size from $\frac{7}{16}$ to $1\frac{3}{8}$ in. hexagon, and including $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{5}{8}$ in. square sockets. The sockets are made by the same process of drawing as



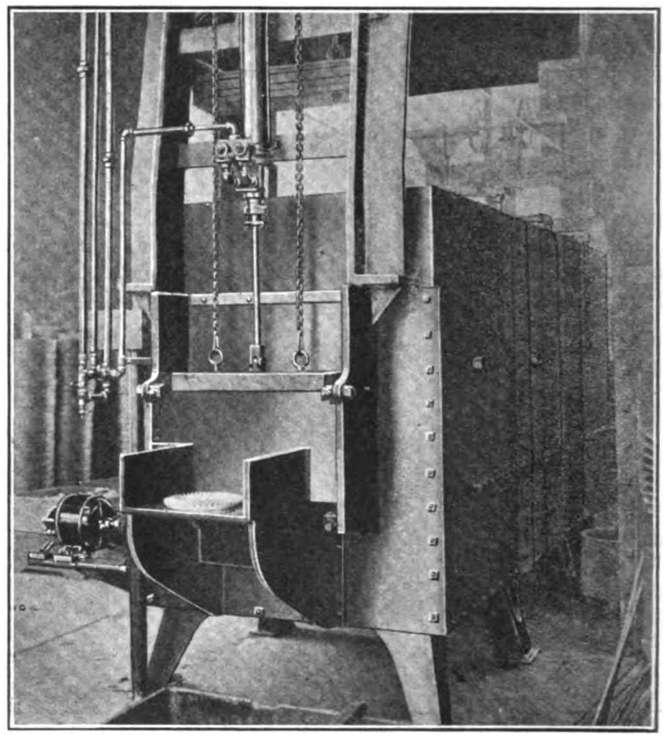
ALLEN "BAY STATE" WRENCH SET

are the Allen hollow head setscrews and subjected to the same heat-treatment. They are claimed to be proof against breakage. The set is put up in a hardwood case, as shown in the accompanying illustration, and it is designated as the No. 19 box set.

Gleason Automatic Hardening Furnace

The American Industrial Furnace Corporation, 10 Post Office Square, Boston, Mass., has undertaken the handling and installation, for commercial purposes, of the electric furnace developed by the Gleason Works of Rochester, N. Y., for hardening gears for automobile transmissions. An end view of the furnace is shown in the accompanying illustration. The control panel is mounted on the side not shown.

The furnace in every way conforms to the latest engineering practice, with respect to electric furnaces, and is adaptable to the hardening of all small and medium size machine parts. It is automatic and continuous in action. The hearth is made up of a series of "thermalloy" rolls, these rolls being geared together and driven by a variable-speed motor. It is designed to



GLEASON AUTOMATIC HARDENING FURNACE

operate at temperatures from 1,000 to 1,800 deg. F. There are fourteen changes of speed to the rolls, thus insuring heating periods to conform to the requirements of a wide range of work.

The furnace hearth has a width of 17 in. and a standard length of 132 in., though this latter dimension is susceptible to variation in order to meet special requirements. Its electrical capacity is 65 kw. and it is capable of delivering to the quenching tank from 450 to 700 lb. of work per hour.

A Time Saver

By Frank Harazim

If we cut the tables of contents out of all the magazines and bind them together between two stiff covers with brass paper fasteners, we will not have to look through all the magazines that are filed away to find a reference. Looking through a magazine is bothersome, especially when the table of contents is located several pages from the front as it is in some cases.

News Section

Little Improvement in Call for Freight Equipment

Freight cars idle because of business conditions totaled 529,658 cars on April 30, compared with 529,884 on April 23, or a decrease of 226 cars, according to reports just received from the railroads of the United States by the car service division of the American Railway Association.

Of that total, 371,538 were surplus freight cars, that is cars in good repairs in excess of current freight requirements, while the remaining 158,120 were freight cars in need of repairs in excess of the normal number unfit for service.

Surplus coal cars totaled 235,077, an increase of 5,185 within a week, while an increase of 1,718 was reported for coke cars within that period, bringing the total to 5,387. Surplus box cars numbered 94,653, a decrease of 3,753 cars since April 23. Reports showed 15,191 surplus stock cars, which was a decrease of 923 within a week. Miscellaneous freight cars also showed a decrease of 1,449 within the same time, the total being 4,891.

Foreign Trade Lists Available for Manufacturers

The commercial intelligence division of the Department of Commerce has recently compiled a number of new and revised trade lists from information submitted by American consuls and trade commissioners. A number of these lists are starred to indicate the relative size and importance of each firm in its community. The nationality of the firms is also indicated. These lists have been mimeographed and copies can be obtained from the bureau or its district and co-operative offices by referring to the title and file number:

Motor cars, trucks, tires, and accessories — Importers and dealers — Belgium EUR-1014-A
Bicycles, motor cycles, and accessories—Importers and dealers—Norway EUR-9002-A
Motor cars and trucks—Manufacturers—Spain. EUR-11015
Agricultural implements and machinery — Importers—Sweden EUR-12012-A
Automotive products — Importers and dealers —Sweden EUR-12034
Motor cars and trucks—Manufacturers—AustriaEUR-15002
Motor vehicles and accessories—Importers and dealers — Siam......FE-17002-B
Motor cars and accessories — British Malaysia FE-18002-B
Motor vehicles and accessories—Importers and dealers—Ceylon FE-22003-B
Hardware importers and dealers — Venezuela..LA-22004-B

Substitute for Stanley Patent Bill

Realizing that compulsory working of patents along the lines suggested in the Stanley bill is too strongly opposed to permit of its becoming a law, Henry Howard, president of the American Institute of Chemical Engineers, and chariman of the executive committee of the Manufacturing Chemists' Association, has suggested a substitute. The substitute has been accepted by Senator Stanley. The text of Mr. Howard's bill provides that two years after the issuance of any United States patent, or at any time after the expiration of that period, if it is shown that the invention covered by such patent is being worked in a foreign country, and that the owner has failed to work it in the United States, and has refused to grant licenses upon such reasonable terms as would make it practicable to practice the patent in the United States, then on the petition of any reputable American citizen, corporation or partnership, exclusive jurisdiction is granted to any United States circuit court of appeals in the district to investigate all the pertinent facts, and the burden of proof shall be upon the owner of the patent to show that he has been and is using reasonable diligence in bringing about the bona fide working of said patent on a scale sufficient to show a bona fide establishment of the industry.

Upon failure to make such showing, the court shall order a non exclusive license granted to the petitioner upon such terms as it shall determine to be equitable.

Academy of Political Science Studies Europe

The part which America is playing and will continue to play, in the rehabilitation of Europe, was the general topic of the twenty-sixth annual meeting of the Academy of Political Science, held on May 12 and 13, at Philadelphia.

The subject was debated and discussed from all sides by speakers from all walks of life. Legislators, executives, ambassadors of foreign nations and educators all joined thoughts in this all absorbing question.

The first session dealt with the industrial and financial situation and its remedies. Speakers included the governmental representatives of the important continental European countries.

Another session took up the question of the relation of America's prosperity to the rehabilitation of Europe. Speakers included Senator Sterling, of South Dakota; Albert Strauss, of New York; S. M. Vauclain, of Philadelphia; W. S. Culbertson, of Washington and Dr. George B. Roorbach of the Department of Commerce.

The European debts to the United States were discussed at another meeting. Senator Owen of Oklahoma, and E. R. Platt, of the Federal Reserve Board, were the speakers.

Southern Metal Trades in Savannah

The annual convention of the Southern Metal Trades Association will be held on June 19 and 20, at the Hotel Savannah, Savannah, Ga. Gus F. Meehan, of the Ross-Meehan Foundry Co., of Chattanooga, president of the Association, will preside.

While the program for the convention has not as yet been completed, there will be addresses on technical subjects and on the general business situation as it affects the metal trades industries of the South. One speaker will be Horace Lanier, of the West Point Iron Works, of West Point, Ga.; there will also be an address by J. R. McWane, president of the McWane Pipe Co., of Birmingham.

Weights and Measures Conference Next Week in Washington

The Fifteenth Annual Conference on Weights and Measures will be held at the Bureau of Standards at Washington, May 23, 24, 25 and 26. These conferences are attended by government officials interested in weights and measures and by weights and measures officials of states, cities and counties. The sessions are also attended by manufacturers of apparatus and by representatives of industries interested in the general subject. A feature of each of these conferences is the display of manufacturers' exhibits of weighing and measuring apparatus.

The program includes an address by the Secretary of Commerce. C. A. Briggs, of the Bureau of Standards' staff, has taken as his subject "The Metric System: How Would it Be Put Into Effect?" H. W. Bearce, also an official of the Bureau of Standards, will discuss "The Fundamental Standard of Length." John N. Mackall, the chairman of the Maryland State Roads Commission, will point out how portable weighing devices can be used to protect highways. George Warner, chief inspector of weights and measures of Wisconsin, will discuss equipment for testing heavy capacity scales. Other speakers scheduled to appear include: William F. Cluett, chief deputy inspector of weights and measures, of Chicago; J. J. Cummings, chief inspector division of standards, State of Massachusetts; W. T. White, director, Bureau of Weights and Measures, State of New York; Representative Albert H. Vestal, chairman, Committee on Coinage, Weights and Measures, House of Representatives; W. B. McGrady, chief, Bureau of Standards, State of Pennsylvania; P. C. Brooks, president, Scale and Balance Manufacturers' Association; J. J. Holwell, commissioner, Mayor's Bureau of Weights and Measures, City of New York; and John M. Mote, inspector of weights and measures, State of Ohio.

Ninth National Foreign Trade Convention

Outlook for Distribution of American Products Abroad Discussed by Experts—Transportation and Exchange Problems Studied

The Ninth National Foreign Trade Convention held its sessions in Philadelphia at the Academy of Music, May 10 to 12 inclusive. The first day's program included discussions on "A Foreign Loan Policy That Will Enable Idle Factors to Get Work," by J. T. Holdsworth; and "A Practical Method of Putting Our Surplus Gold to Work in Financing Foreign Trade," by Julius H. Barnes. These subjects were discussed from the standpoint of general farm products, manufactures, cotton and the foreign trade merchant.

"The Factor of Depreciated Currency" was discussed by Chas. M. Muchnic, vice-president of the American Locomotive Sales Corporation, who has just returned from an extensive trip in Continental Europe. He said in part:

"There are vast potential demands for all kinds of our products and there are in Europe vast potential means for production and the creation of wealth and consequently of purchasing power or capacity. What is required is faith and confidence in them and the supply of the necessary capital to hasten their general industrial revival. Before the world can again become a large purchaser of our manufactured products we must see a Europe prosperous, busy, producing; the sale of our manufactured products to Europe will follow the sale of our foodstuffs, copper, cotton and other semi-manufactured products.

Europe Not Prosperous

"The present depression in our export trade is not due to German, Austrian, Belgian, French or British competition but to a world lack of purchasing power. German exports, in spite of its depreciated currency, are, according to Dr. Walter Rathenau, only 25 per cent, of its pre-war records. There is unemployment in Belgium and in England; and French industry is largely engaged in the reconstruction of its devastated territories and industries," continued Mr. Muchnic.

"It is interesting to note that while in England, France, Belgium and in the United States wages and costs of living have been materially reduced during the year 1921, and the tendency is for still further downward readjustment; in Austria the reverse has taken place. I was quite surprised to find during my recent visit to Vienna that the costs of practically everything was from fifty per cent to one hundred per cent more than in Germany and nearly as costly as in London, Paris or New York. Austria reached the natural or the gold basis of cost of production. When we bear in mind that in the cost of production of any article in any part of the world enter, first, cost of the raw materials, second, cost of labor which is dependent on the cost of food, shelter and clothing, and third, the cost of plant and depreciation, we inevitably come to the conclusion that the costs of production of all similar manufactured products in all parts of the world must eventually be equalized on a gold basis with possibly the same differentials between various countries that existed before the war."

The other addresses of the session were "Why We Must Have Foreign Trade," by James S. Alexander and "The Effect of High Taxation on Exchange," by J. C. Ainsworth.

The attack on our educational system by Dr. R. S. McElwee, Dean of the School of Foreign Service at Georgetown University attracted attention. Among other things Dr. McElwee stated that the deficiency in knowledge of modern languages, place geography, English composition, beaux arts and the principles of economics was deplorable.

Methods All Wrong

"The deficiency in modern languages is too well known. It seems that all language teaching, almost without exception, is approached from the wrong angle in our national language teaching. Until any individual has mastered the spoken language to a sufficient extent to have some feeling for the language to have it ring in his ears, it seems to me almost worse than useless to drag him through the very metriculous refinements of grammar and difficult classical literature. On the other hand, if a student can read the daily papers and magazines and speak with a good accent and in the usual phrases and idioms, not just words, he can be brought to feel the actual living language of a people—as they use it in their daily lives of business, religion and pleasure. We commence at the wrong end—for instance, imagine teaching a Frenchman English by beginning with a minute examination of all the finest phases of grammatical construction, by learning columns of isolated words and then a text from Shakespeare, Milton, or Browning.

"The knowledge of Geography of high school and college graduates alike, who enter the School of Foreign Service, is almost entirely a cipher. We have found it necessary to put in a clause in the Catalogue to the effect that, 'Before graduation candidates for certificates or degrees must pass a special examination in geography, and that no student who is deficient in Place Geography will be graduated.'"

The topic for the main session of the second day concerned shipping in its various forms. The topics were: "The American Merchant Marine," by W. C. Conlen; "Inland Waterways as Developers of Traffic," by W. H. Stevenson; "Shipbuilding Prospects," by J. I. Ackerman; and "Marine Insurance," by Charles R. Page. The question of transportation costs was discussed by William H. Stevenson, president of the Lake Erie & Ohio River Canal Board of Pennsylvania, as follows:

"At the present time the most important business question to be settled for the American people is that of the early provision of cheap, regular and adequate transportation facilities.

"We cannot hope to properly meet foreign competition for exports unless we have a much lower rate for our products to our coasts, for we have to contend with the much cheaper foreign labor within other countries and also with cheaper carriage on foreign ships, as well as the shorter hauls to their seaports on the internal waterways of other countries.

"The figures for March, 1922, show that while our exports were $55,000,000 less than for March, 1921, our imports were $6,000,000 greater. As I have said, our capabilities for production at present are much greater than the demand for our products, and we must therefore greatly increase our foreign trade. We realize now that the saying that 'no one can live unto himself alone' applies with even greater force in the case of nations and so it is necessary for us to cultivate as much as possible our trade relations with other countries.

"The railroads thus being unable to adequately supply the cheap and prompt transportation from the interior to the coasts so requisite for the securing of our proper share of the foreign trade, to what other agency must we look?

"The one great vital connecting link in this nation-wide system of waterways is the Lake Erie and Ohio River Canal. This will connect the Ohio River with Lake Erie.

"The canal with double locks will have a capacity of at least 76,000,000 tons annually. Great industries of the district have already specifically promised it 50,000,000 tons of traffic, five times the traffic on the Panama Canal, and the smaller ones will supply an equal amount. The canal will traverse the greatest tonnage district in the world, through which there has been moved about 400,000,000 tons in one year. Every ten years the traffic has doubled. So you can see the vast possibilities of this waterway, the bulk of the traffic on which will be iron ore coming south and coal going north. Of both these materials there are supplies to last four hundred years."

Ocean Carriage and Marine Insurance

Under the general heading of "Ocean Carriage," W. H. La Boyteaux presented a paper on the vital points in marine insurance policies. He said in part:

"Although in the United States all insurance companies are subject to state regulation and supervision in respect to their financial status, this, however, does not prevent insolvency, and is no protection against bad management. The 'morale of the company is quite as important as the financial position.'

"Great care should be taken in the placing of marine insurance in foreign markets," continued Mr. La Boyteaux. "The English market is generally recognized as a world's market. For years it has done a world-wide business. Orders for marine insurance are sent there daily in large volume from every country in the world. The capacity of the market is almost, if not quite, as large as the combined capacity of all the outside markets. Its underwriters

have realized the necessity of conducting their affairs on broad and liberal lines and have established an enviable reputation in respect to security and fair dealing. The marine insurer doing business in the United States is the equal of the insurers in England in every way. Also, that entirely apart from sentimental considerations many business reasons exist why American merchants should always give every preference to the American market. This market deserves your loyal support, and that it will get it I have no doubt.

"The marine insurance policy is the contract between the insurer and the insured. The protection afforded by the policy depends entirely upon its terms just as in any other contract. It may furnish a broad and comprehensive protection, or a narrow and restricted one. It is a contract dealing with a complicated subject requiring special knowledge of the rules of law laid down by the courts and of established customs and usages. Few who take out marine policies will trust themselves to make their own contracts with the insurer. They want expert advice and guidance, and for this they go to a broker whose business it is to act for the assured and upon whom they can depend to prepare and negotiate with insurers a contract suited to their needs. There are many such brokers who are not the agent of the companies but act entirely as expert advisers to the buyers of insurance in all matters pertaining thereto, including the handling of their losses.

"The cost is important, but the character of the protection and the security is more so. If you are buying protection you want good, conservative protection,—Class A bonds, not speculative security. The first cost may be slightly higher, but the final cost is less."

South American Business

At the same time another group discussed market conditions abroad, these including "European Business," by C. . Warren; "South American Business," by F. de St. Phalle; and "Far Eastern Business," by E. G. Anderson. Regarding South America, Mr. de St. Phalle said:

"While South Americans do trade rith Germany, they have experienced iany disappointments connected with ite deliveries, inferior material, and, ecently, by increases in invoice values f accepted prices. This tends to bring out greater consideration and better eling towards the United States.

"The future holds out bright prosects for South America and for the nited States. South America will delop at an increasing rate because it the most attractive and richest of e thinly populated sections available. addition to the future Development South America being greater, a rger proportion of this development ll be financed and carried out with e assistance of the United States. onomic factors governing the movents of exchange are now better unrstood in South America and the ny loans recently issued from New rk to South American countries, ipled with the rising tendency of exinge, have greatly improved the feel-. In the future South America ks to increasing growth carried out an increasing extent with the astance of American financial, engineering and business co-operation, all of which is being prepared for at this time.

"With the general recovery of trade, South American exchanges may be expected to rise; some of them have already done so materially. The Argentine will unquestionably return to gold exchange within a comparatively short time. The fall of exchange usually caused by excessive buying and insufficient selling carries within itself its own remedy. By cutting down the country's buying power it reduces imports and lowers prevailing wages by comparison with outside standards which should in time foster exports. The reason for the activity of the copper mines in Chile while the mines in the United States were idle, was the low cost of Chilean labor in terms of gold."

The Exchange Situation

The last day had a very full program beginning with the "Interest of Agriculture in Foreign Trade," by Harvey J. Sconce; "Need for Imports to Pay for Exports," by Walter Lichenstein; "Factors That Will Help the Exchange Situation," by Fred I. Kent; and "A Foreign Trade Policy for Americans," by James A. Farrell. Regarding exchange Mr. Kent offered the following suggestions:

Co-operation with Russia along lines aimed to reduce the menace of the Red Army; Eliminate the menace of the vicious propaganda of its present rulers;

Obtain recognition of the rights of the Russian people to have a free press, a free expression of opinion, free elections of government officers and definite property rights;

A quick settlement of the German reparations with terms of payment compatible with existing conditions even though they recognize, as they should do, that Germany should pay a real penalty.

A cancellation after agreements as to co-operation of some percentage of the Inter-Allied loans that can fairly be estimated to represent a direct and legitimate war charge to the nations taking part in the cancellation;

Reduction of governmental waste;

Stoppage of inflation caused by the issuance of new currency and increase in floating loans;

The removal of trade barriers by means of special commercial treaties and agreements between nations;

Greater co-operation between capital and labor so as to allow for the increase of production as rapidly as concurrent developing conditions enable its absorption; a better world morale working toward the elimination of class and national hatreds and the increase of integrity and square dealing.

Financing Exports

The group session dealing with the problems of the exporter included addresses on "Financing Export Shipments," by W. H. Knox; "Co-operation of Export Merchant and Manufacturer," by C. W. Beaver, and a paper of similar nature by G. R. Parker. Export advertising aimed to reduce the cost of export selling was discussed in "Practical Use of Available Information," by Wm. Menkel; "Organization and Management of Advertising Forces," by Jas. S. Martin; and "Co-operating with Dealers," by D. L. Brown.

Another group on foreign credits and credit information had three interesting papers: "The Three C's in Foreign Credit Guaranty," by A. T. Richards; "Practical Safeguarding of Foreign Credits at Minimum Cost," by M. H. Hopkins; and "Guide Posts in Foreign Credit Guaranty," by L. R. Browne, who said:

"One whose province it is to administer foreign credits should bring vision and understanding to its problems, striving to look into the future, not permitting himself to be bound by a too narrowly restricted consideration of the one problem before.

"The aim of the credit manager should be: To build a foundation for future business that will endure. He should be actuated by larger motives than the desire to invariably and above all things play safe no matter what may fall.

"Granted the vision and understanding which success in his field of endeavor demands he will perhaps at times assume risks which, if measured solely by a rigid application of any set of hard and fast credit rules, would seem to carry more than ordinary business hazards but with supreme faith in the people with whom he deals, in the fundamental soundness of their country and the worthiness of their motives—all these, the offspring of knowledge—he will take his risk confidently, sure, even in the face of a conviction that conditions may require the granting of extensions or that drafts may not be paid exactly on maturity dates that time and results will bring justification. He will build good-will and confidence and inculcate in the minds of his foreign customers that priceless asset—an unshakable confidence born only of the highest type of intelligent, dependable and sympathetic service."

Importance of Credit Supervision

Mr. Browne then went on to describe in detail the ideal credit manager whom he pictured as one knowing as much about other countries, the lives and habits of other people as he should concerning those of the country in which he lives and whose language he speaks.

"There is a fairly general and mistaken impression that credit information is limited to such facts as may be found only in a financial statement, analyzed according to fixed rules, coupled with a summary of expressed opinions as to character and capacity," said Mr. Browne.

"In its broader aspects, credit information goes far beyond any such narrow limits, especially to one whose responsibility it is to determine the measure of the risks involved in foreign transactions. There are few known or ascertainable facts bearing on the lives of the people of countries with which he deals, whether of a political, traditional, historical, phychological, social, economical, physical, geographical, climatic, commercial or of even a religious character that should be lacking in interest to the foreign credit grantor or be considered of no value to him or by him. The greater store of such knowledge he possesses or is in position to command, coupled with ability to apply it with judgment, the more efficient he becomes."

A banquet, at which Gov. Sproul of Pennsylvania spoke on "Foreign Trade and Domestic Prosperity," closed the convention.

Manufacturers See Prosperity Ahead

Twenty-four Hour Report from Industrial Centers Shows Great Improvement—Favor Greater Navy and Merchant Marine—Edgerton Re-elected

A decidedly optimistic outlook for American business and a greater faith in the future of our industrial life, was the keynote of the twenty-seventh annual convention of the National Association of Manufacturers, held in the Waldorf-Astoria Hotel, New York City, on May 8, 9 and 10. The convention was attended by over five hundred of the most prominent manufacturers in the United States. Practically all lines of business were represented and the general spirit of the meeting was one of revived optimism and an awakening of business men to a greater responsibility of their relation to the needs of the industry.

The outstanding feature of the three-day meeting was the twenty-four hour report on business conditions which was presented at the afternoon session on Tuesday. This report gave a first-hand résumé of business conditions as they were during the first twenty-four hours during which the convention was in progress. In announcing the result of the survey, President Edgerton said that business was shown to be on the upgrade in practically all the basic industries and that "we have not only turned the corner, but are now leaving it very far behind." The survey was compiled within twenty-four hours of its presentation and was based on more than 30,000 answers from a questionnaire sent to all members of the association, and represented an immediate summation of conditions in every section of the country.

Among key industries the survey showed conditions in the iron and steel trade classed as excellent in 6 per cent of the plants reporting; 25 per cent were stated as good; 52 per cent as fair and 17 per cent as poor. For the fall this industry reported prospects of excellent business in 4 per cent of the replies; good in 50 per cent of the replies; fair in 43 per cent of the replies and poor in only 3 per cent. Compared with last year, 75 per cent of these factories and mills reported conditions better than last year; 15 per cent report conditions lower and 10 per cent of the cases report no change. Stocks were reported normal by these industries in 60 per cent of the cases, low on 33 per cent and over in only 7 per cent. As to employment, a large increase was reported in 23 per cent of the cases; a small increase in 47 per cent of the cases; a large decrease in only 6 per cent and a slight decrease in 23 per cent. For the fall the outlook is for a large increase in 32 per cent of the factories, a small increase in 68 per cent, and not a single one reported no increase.

Eighty Per Cent Normal

In the machinery and tool industry, 80 per cent of the replies reported present conditions from fair to excellent and the remainder reported less encouragingly. Ninety per cent look for fine business in the fall. In 70 per cent of the replies, business is reported better than last spring; 16 per cent seeing no appreciable change, and 14 per cent finding a decreased business. They have increased their factories' forces, but for the fall 90 per cent look for a decided increase in the working forces and less than 1 per cent look pessimistically for a large decrease in employment.

In his annual address to the association, President John E. Edgerton urged the members to lend their influence and effort to the combating of syndicalism and socialism, "and other mental and moral diseases with deceiving names" which are invading our schools, churches and legislative bodies. He concluded with an expression of his belief that the country would soon be on a normal production basis.

More Production Needed

He said: "The chief of all the economic problems of this hour is a world production sufficient for a world's needs, and a simplified system of distribution that will reach to every human being. The proportion of consumers to producers is too large, and the energies and talents of too many people are engaged in the process of distribution. When you add to the superflous number of the distributors of the products of the producers the countless host of those whose chief activities are to reform, regulate, inspect, denounce, tax, plunder and otherwise live upon those who are trying to produce something, it will not be difficult to discover the principal factor in the continuing high cost of living.

"But we have in America all of the materials and brains necessary to the restoration of a wholesome condition throughout the country, and a large amount to spare to other more unfortunate peoples. And in spite of the innumerable obstacles ahead of us at the beginning of our march toward stable conditions, and of the many yet unsurmounted, I am one of those who believe that we have made all of the progress that we could have reasonably expected to make in so short a time after the world cataclysm, and that we shall continue with probably occasional halts to the heights of a national and world greatness not hitherto known."

The Monday evening session was devoted to a discussion of foreign trade, its present status and its future possibilities. Edward C. Plummer, commissioner, United States Shipping Board, spoke on the relation of the merchant marine to our foreign trade. He said that it was a recognized truth that only through its own ships can a country properly develop its foreign trade and that it was evident that only through such a merchant marine as we propose that the foreign trade of this country could be properly developed, and the industries of this country be given their proper opportunities. Shipping is a means and not an end.

In pleading for a nationwide support of a greater merchant marine he said in part: "One very common plan apparently adopted for the purpose of misleading the public appears in the statement so often made that the United States aims to become commercially supreme upon the seas. No intelligent American aims at that. What thoughtful Americans desire is that the United States shall have a merchant fleet sufficient to enable this country to handle a similar proportion of its foreign commerce, and the proportion which England has insisted on carrying of her own foreign commerce, viz., from 60 per cent to 75 per cent is good enough for us—but we should insist upon carrying as much in the interest of the people of this country.

"To claim anything else is merely to say in effect that we don't want American ships to carry any material part of the commerce of this country—that we don't want to enlarge the markets for American products or give increased employment to American labor."

F. C. Schwedtman. vice-president of the National City Bank, New York, spoke on the financial side of the foreign trade question. He devoted the greater part of his address to an analysis of foreign loans and the position of American banks in the upbuilding of foreign trade. The stabilization of the principal currencies of the world, he declared, was a pre-requisite to the prosperity of world trade, and he explained the extent of and the limitations on aids to exporters by American banks.

He said: "World trade can never prosper until the principal currencies of the world are stabilized. The credit structure must be built on factors that are reasonably certain. The world's desire for a fixed gold standard by which goods may be valued and business carried on is shown by the widespread desire in every country for dollars."

While he gave an emphatic affirmative to the question whether foreign bond issues sold here were beneficial to our foreign trade, he was equally emphatic in declaring against restricting the spending of the proceeds of these flotations to American merchants and manufacturers.

Governmental Regulation

The afternoon of Tuesday was given to a business revival session. The main speaker was Senator Walter E. Edge, of New Jersey, whose subject was "The Duty of Government to Business." The Senator gave a brief summary of his resolution, recently introduced in Congress, providing for governmental regulation of trade association activities. He said:

"I recognize that business doesn't like governmental regulation and I sympathize with business in that viewpoint, but my friends you must take one thing or the other: You must either take, under present conditions, continued investigations and efforts of grand juries, to indict business representatives (because they in many cases innocently trespass upon the present acts regulating business and that is happening today as you well know); or you must accept the official co-operation of some governmental body which has delegated power to talk to your representatives and to discuss the limit to which you can go, in their judgment, in the way of publishing information, statistics and all the other activities that trade associations indulge in."

Other speakers at this session were: J. R. Howard, of the American Farm Bureau, on "The Farmer and Industry"; R. C. Marshall, Jr., Associated General Contractors of America, on "The Greatest Revival in the Construction Industry"; J. D. A. Morrow, National Coal Association, "The Outlook for Coal"; W. Averell Harriman, United American Lines, on "The Future of Our Shipping Industry"; C. M. Ripley, General Electric Co., on "Interpreting the Corporation to the Worker."

On Tuesday afternoon the officers and directors of the association were invited to the Brooklyn Navy Yard by Admiral R. E. Coontz, chief of Naval operations, U. S. N. The party was entertained on the battleship "Wyoming," flagship of the Atlantic Fleet. Rear Admiral John D. McDonald, commander of the fleet, welcomed the guests on board, and in a brief after-dinner speech asked them to give some thought to the proposed cut in the Navy personnel. He said that ships do not fight ships, but that men fight ships. The guests were conducted on an inspection of the vessel by the staff officers of the Admiral.

At the annual banquet held in the grand ballroom on Tuesday evening James A. Emery, general counsel for the association, was toastmaster. The speaker of the evening was Admiral R. E. Coontz, U. S. N., who made a stirring appeal for a greater and better navy. He dwelt at some length on the value of the Navy as a factor in foreign trade, detailing its work in the past in opening foreign ports and keeping the seas open to American traders. He said that $300,000,000 a year was not much to spend on a Navy that aided so materially in maintaining an annual foreign trade of over eight billion dollars.

He said, "If we spend $300,000,000 a year on the Navy, and thereby maintain an open market throughout the world for $8,000,000,000 worth of exports, is this not a good investment? Money spent on the Navy serves the dual purpose of insurance in time of peace and a fighting force in time of war. We should have a Navy of sufficient strength to support our policies and our commerce, and to guard our continental and overseas possessions. Our foreign policies are as strong as our fleet and no stronger.

Fallacy of Disarmament

On the subject of disarmament he had this to say: "It is a popular fallacy to think that a holiday in battleship building will bring a great reduction of taxes. A slight study of history is sufficient to show that disarmament will not prevent war. Many of the pacifists seem to think that military forces are only bent on destruction. As a matter of fact they are really constructive. Wherever they go, they better local conditions, establish schools and improve public health. Panama at one time before we went there was a fever infested place where human beings died like flies. It can truly be said that our armed forces have saved more lives than they have taken."

The subject of trade associations which has occupied the minds of public officials and business men of late was thoroughly discussed at the Wednesday morning session. Secretary of Commerce Herbert Hoover was chairman of this session and delivered the opening address. Mr. Hoover gave an intelligent analysis of this question. He praised the work of legitimate trade associations and said that their assistance has been invaluable to the Department of Commerce in its reorganizing work.

Referring to the recent governmental investigation of the purpose of certain questionable practices in trade associations, he said:

"It is my belief that if trade associations are to grow in beneficent directions they should have some definition in law that will remove the uncertainties of their situation.

"The proposal that I should like to put forward for your consideration is a simplification of the proposals recently made by Senator Edge. I claim

JOHN E. EDGERTON

no originality in them, for similar suggestions have long been under discussion. Without entering upon legal formulation, my suggestion is that there should be enacted a minor extension to the Clayton Act to the effect that interstate trade associations should be permitted to file with some appropriate governmental agency the plan of their operations and the functions they propose to carry on. That upon approval of such of these functions as do not apparently contravene the restraint of trade acts, they may proceed with their operations. If, upon complaint, however, either of individuals or the law officers of the Government, that these functions do restrain trade, then after a hearing and proof the right to continue these particular functions shall be suspended, and if continued they shall be subject to prosecution. Also, if it shall be proved that they have extended their activities beyond the functions in their original proposals they shall be subject to prosecution from restraint of trade violations. Associations which do not wish to secure this limited interpretation of the law with its assistance to confidence should not be required to do so; they, however, necessarily assume themselves the job of interpreting the law with the risks such interpretation entails. All who know the situation in these associations will realize that in the main their membership comprises a smaller business. Such measures will serve to protect small business, for big business takes care of itself.

"I need not refer here to the beneficent results that have been attained to the community by the legitimate associations in the safeguarding of quality of goods, in reduction of waste in manufacture and distribution, in promotion of foreign trade, and a score of directions that make for the upbuilding of our commerce and industry. These are the sort of things that we must preserve in American life."

Other speakers at this session were: Alfred L. Reeves, president, Trade Association Executives of New York; Morris L. Ernst, counsel, Jewelers Board of Trade, New York; H. B. Thompson, counsel, Proprietary Association, Washington; C. R. Stevenson, of the Stevenson Corporation.

On Wednesday afternoon the convention was addressed by the Secretary of Labor, James J. Davis, who devoted his remarks to an explanation of the work of his department in its relation with the employer and the working man. He asked for the co-operation of the manufacturers in making the Department of Labor a greater force in curing industrial ills. He declared that unemployment was a piece of "needless stupidity," and wound up with a plea to employers to give every opportunity to the younger generation to learn a trade, which he declared was the foundation of a good education and a good business training.

Against the Bonus

Several important resolutions were presented and adopted at this session. One called upon Congress to maintain a Navy of the United States at a ratio in keeping with the national dignity and of sufficient strength to assure adequate defense. Another resolution condemned a cash bonus for World War veterans, but commended the work of the U. S. Veterans' Bureau in its work of rehabilitation and vocational training. The convention also approved by resolution the proposal of President Harding in asking Congress to support an adequate American Merchant Marine. Still another resolution asked for substantive changes in the present tax laws, so as to provide a better recognition of business enterprise by assuring a greater return on capital invested. The association went on record as opposed to the Stanley patent bill (S-3410), "because it introduced in our patent system an obligation on American patentees to work their inventions within a limited period and subjects them to the grant of compulsory licenses, both of which provisions are an unwise innovation in the American patent system . . . this will discourage invention and impair the value of American patents and will impede, instead of promote, the progress of the useful arts in this country."

The election of officers resulted in the unanimous selection of John E. Edgerton, of the Lebannon Woolen Mills, Nashville, Tenn., to serve another term as president. Vice-presidents were chosen from each of the states represented. George S. Boudinot, of New York was elected secretary and Henry Abbot, treasurer.

The closing number on the program was a motion picture showing of industrial films. As the pictures were thrown on the screen, they were explained by men from the field of industry which they illustrated. Mining, farming, electrical phenomena, railroad operations, and radium production were some of the subjects covered

Supply and Machinery Men Hold Conventions

Manufacturers and Dealers Talk Over Business Problems—Legislation to Unfetter Business Urged by Manufacturers—Spirit of Sane Optimism Shown

Very interesting and profitable conventions were held on May 8 to 10 at the Marlborough-Blenheim Hotel, Atlantic City, N. J., by the American Supply and Machinery Manufacturers' Association and the National Supply and Machinery Dealers' Association.

Business conditions were fully discussed and ideas as to the future exchanged. The needs of an intelligent interest in world problems and of the application of sound economic principles to business were quite generally expressed. The keynote of the manufacturers' meeting was the liberation of business from the legislation that now hampers its activities. The dealers were interested primarily in ways and means to reduce overhead expense, so as to enable them to do business under present conditions.

The American Supply and Machinery Manufacturers' Association began on Monday morning with an executive session that was largely a continuation of the meeting held at Birmingham on April 24 to 26. President N. A. Gladding, of E. C. Atkins & Co., Inc., Indianapolis, in his opening address laid stress on the importance to the business man of keeping well posted on developments of importance to the community and to business in general. After citing cases such as the proposed Edge law and the bonus bill now before Congress, he stated that business men must make themselves felt in Washington in order to affect the legislation on problems in which they are so vitally concerned.

Capt. John W. Gorby, of the Cyclone Fence Co., Waukegan, Ill., told in a very interesting way how some concerns have solved the post-war business problems. He said that the best means at the disposal of the business man for meeting the present conditions are the use of advertising, better salesmanship, and the more rapid turnover of goods. Captain Gorby believed that our problems would all eventually be solved through the great and varied resources of America and her people. His closing remarks dealt with the need of faith in the future, centering about the words, "As your faith is, so be your prosperity."

The need of applying sound economic principles to business was brought out by A. T. Simonds, of the Simonds Manufacturing Co., Fitchburg, Mass. He said that we needed the ability to better predict the future of business, in order to cut out the valleys and the peaks of the business curve. To do this a man must have a broad knowledge of the factors entering into the problem, and he cannot limit his knowledge to one line of work. Mr. Simonds said that he thought business in general too much hampered by legislation, and pointed out the advisability of putting business men in position to make our laws. He predicted that the wave of activity now beginning would be short, being broken by a depression and followed by a long period of falling prices.

In the afternoon the session was held jointly with the National Supply and Machinery Dealers' Association. President Gladding opened the program, treating chiefly with business as related to affairs at Washington. He decried class legislation, but advised close contact with the law-making machinery of the country. He asked that support be given to Secretary Hoover and to others who are doing constructive work for business in general.

An excellent address was delivered by Rev. James E. Crowther, D.D., of Philadelphia, on "Theodore Roosevelt—American." In telling of the qualities and the varied activities of our late president, Dr. Crowther showed that Roosevelt was the very embodiment of the idea of Americanism.

IRVING W. LEMAUX
President of Manufacturers

The necessity of "seeing things as they are" was brought out by G. A. O'Reilly, vice-president of the Irving National Bank of New York. He applied this necessity particularly to conditions abroad and to our relations with other countries. It is useless to attempt to hurry developments, such as the financing of export trade, until the country at large realizes the importance of such steps and is ready to take them. For this reason general education on the value of foreign trade is necessary before any attempt is made to create a mechanism for carrying on such trade. Mr. O'Reilly said that he believed we would never "go back to normal," because we are constantly progressing. Our problems, however, will work themselves out just as they have been doing.

The dealers' and jobbers' problems and viewpoint, with particular reference to the South, were presented on Tuesday afternoon by Alvin Smith, of the Smith-Courtney Co., Richmond, Va., and secretary of the Southern Supply and Machinery Dealers' Association. He treated such subjects as discounts, wholesale prices and the cost of doing business. Mr. Smith urged manufacturers to maintain definite sales policies, so that dealers are afforded greater protection. He spoke of the value of the dealer to the manufacturer and asked for better acquaintance and closer co-operation between them for their mutual advantage.

The keynote of the whole convention was struck by the Honorable Felix H. Levy, of New York, who addressed the association on the subject of "Anti-Trust Laws." He stated that business men were too greatly hampered by legislation, which interferes with the very details of their daily business. The Sherman Law has fallen from its original purpose of breaking the big trusts, and is now restricting business in a way that is detrimental to its growth. Mr. Levy believes that the recent decision in the Mennen case is a mis-interpretation of the Clayton Law. He believes that historians will consider as very unique our laws governing business, as they are opposed to those existing in all other countries. Business men are prevented from employing through their trade associations the greatest means that could be used for stabilizing business, that of agreeing on terms of sale and prices. The efforts of Senator Edge and of Secretary Hoover deserve commendation, Mr. Levy said, although the passage of laws to unfetter business must mean also a revision of the Sherman Law.

The last session, held Wednesday morning, was primarily executive. A resolution was adopted supporting Senator Edge of New Jersey in his attempt to relieve the hampering of trade associations by the existing anti-trust laws. The resolution "earnestly recommends to Congress enactment of suitable legislation which will remove the hindrances and obstacles placed by the anti-trust laws upon trade associations, whereby co-operation by them in many important fields of activity is prevented."

Cincinnati was chosen as the place of the next convention.

The officers elected for the coming year are: President, Irving W. Lemaux, Indianapolis Brush and Broom Manufacturing Co., Indianapolis, Ind.; first vice-president, Dave C. Jones, Lunkenheimer Co., Cincinnati, Ohio; second vice-president, C. W. Machon, Brown & Sharpe Manufacturing Co., Providence, R. I.; third vice-president, M. B. Skinner, M. B. Skinner Co., Chicago, Ill.; executive committee, A. T. Simonds, Simonds Manufacturing Co., Fitchburg, Mass.; Joseph M. Hottel, Delta File Works, Philadelphia, Pa.; John C. Ruf, T. B. Williams & Sons, Dover, N. H.; W. H. Glatt, Victor Balata and Textile Belting Co.. New York, N. Y.; W. H. Fisher, T. B. Wood's Sons Co., Chambersburg, Pa. F. D. Mitchell, New York, N. Y., continues as secretary-treasurer.

The attendance at the convention was quite large, and great interest was shown in the program. In the evenings entertainment was provided for members and their guests, a dance being held on Monday and a concert on Tuesday.

National Supply and Machinery Dealers' Association in Seventeenth Annual Convention—Reduction of Overhead Expense the Greatest Problem of the Dealer

The National Supply and Machinery Dealers' Association devoted its opening session largely to discussing the business situation with relation to machinery and supplies. President Crannell Morgan, of the Hardware & Supply Co., Akron, dealt in his address with the problems that now face the machinery dealer. He spoke of the activities of the dealer during the war and the period immediately following it. Although expenses incurred in selling were very high during that period, the margin on which business was conducted was held practically constant because of the large volume of the business. Now, however, the volume is so small that reduction of the overhead expense is necessary in order to make business again profitable. More rapid turnover and conditions of trading with the manufacturers that are at least as favorable as must be extended to the customers, are the chief means of making trading safe in the near future.

The report of the secretary, Thomas A. Fernley, gave a résumé of the year's work and the prospects for the future. The attitude of the government toward the work of trade associations was given attention, as well as Federal tax problems. The price position in the industry and the matter of overhead expense received particular mention.

A discussion and interchange of information that brought out many interesting facts regarding business conditions then followed. Most of the members have now greatly reduced their stocks of merchandise, and have consequently reduced overhead expense. A faster turnover seems necessary in order to survive the existing conditions. Although most of the dealers aim to handle, in the main, goods on which the investment can be turned over four times a year, few of them have been able to obtain this rate.

The members as a group stated that business had improved somewhat, and they believed that it would continue to do so for some time. However, because of the condition of the market and the smallness of margins, averaging only 10 per cent on most lines, inventories and overhead must be watched with the greatest care for several years to come. Although it was believed that a reinstatement by the manufacturers of pre-war selling terms and conditions was desirable for stability, it is not now possible of attainment.

On Monday afternoon a session was held jointly with the American Supply and Machinery Manufacturers' Association, as just related.

The session on Tuesday morning was devoted to talks by manufacturers giving information regarding such business conditions as supply and demand, raw material, labor, present consumption and the prospects for consumption and prices in the future. J. H. Williams, president of J. H. Williams & Co., Brooklyn, spoke of conditions in the drop-forging industry. Mr. Williams urged co-operation between dealers and manufacturers in order that a firm basis for transactions could be developed. He stated that the drop-forging industry was at present greatly disorganized. He expected that the deflation that remains to be done would occur gradually and that further revival would be necessary before additional liquidation would occur. He expressed the belief that the next tendency in prices in his line would be upward.

Conditions in the twist-drill industry were described by Robert S. Carter, sales manager of the Whitman & Barnes Manufacturing Co., of Akron. It was shown by the speaker that present prices of twist drills are below the cost of manufacturing and selling them, and that the next price movement must logically be upward in order that the industry may survive. The volume of sales at the present time is increasing. Mr. Carter advocated a bigger margin on which to do business, as well as very liquid stocks for the jobber. He spoke favorably of the European plan of selling goods, in which the buyer pays directly for each extra service that is given him, instead of caring for all service costs in the original price.

W. J. RADCLIFFE,
President of Dealers

Irving W. Lemaux, president of the Indianapolis Brush and Broom Manufacturing Co., Indianapolis, stated that since manufacturing costs are rising, it was logical to expect an increase in selling price. Business is increasing in volume at the present time, so that Mr. Lemaux was optimistic as to the future.

A general survey of business was given by Wallace L. Pond, domestic sales manager of the Nicholson File Co., Providence. Mr. Pond pointed to the large sums now being released by the railroads for supplies, to the better conditions prevailing in the agricultural regions, and to the improvement in business conditions and employment quite generally. The advantages of simplification of stocks were brought out by an example taken from his own concern.

W. W. Sanderson, general sales manager of the Carborundum Co., Niagara Falls, said that conditions in the abrasive industry seemed somewhat better in 1922 than they were in 1919. Since there is too much of a gap between manufacturing and sales organizations, Mr. Sanderson urged greater co-operation. He recommended that business conditions and prospects be carefully analyzed, in order to arrive at a safe basis for continuing operations.

The session was closed by A. T. Simonds of the Simonds Manufacturing Co., Fitchburg, Mass., who told of the value of applying sound economic principles to the conduct of business.

On Tuesday afternoon the subject of the readjustment of overhead expense to meet changed conditions incident to lower prices and slow business was discussed by the members at large. It developed that one of the principal means of modifying the current difficulties lay in the simplification of the variety of goods manufactured. It was recommended that information be exchanged locally in credit matters, so as to mutually protect the dealers. The giving of cash premiums also received attention.

The association desired to call to the attention of government bodies such as the Federal Trade Commission, the right of the supply trade to be recognized in its service of distributing goods. It adopted a resolution to ask for a setting aside or a modification of the order given recently in the Mennen case. The sentiment was that the manufacturer should be free to set selling prices for his dealers, provided that he does not enjoy a monopoly in his field.

In the closing session on Wednesday morning the dealers talked chiefly on the compensation and the handling of salesmen. It developed that, in general, city salesmen do not receive credit for sales to their customers unless they actually take the orders, although country salesmen receive credit for all sales made in their territory even if they do not actually write the orders themselves.

The following officers were elected for the ensuing year: President, W. J. Radcliffe, of E. A. Kinsey Co., Cincinnati; first vice-president, L. H. Swind, Swind Machinery Co., Philadelphia; second vice-president, B. H. Ackles, of the T. B. Rayl Co., Detroit; executive committee, F. Alexander Chandler, of Chandler & Farquhar Co., Boston; H. C. Ellsworth, of the White Tool and Supply Co., Cleveland; and George F. Root of Root, Neal & Co., Buffalo. Thomas A. Fernley of Philadelphia continues as secretary-treasurer and T. James Fernley as advisory secretary-treasurer.

Post Office Gets $376,500 for Canceling Machines

The House and Senate conferees on the postoffice appropriation bill for the next fiscal year have agreed on $376,500 for canceling machines for the postal service, instead of $350,000 as originally provided by the House. Of this amount it is specified that $26,500 shall be used for the purchase and installation of a letter distributing machine, if on test such a machine is found to be satisfactory and efficient. The conferees eliminated the provision that postal funds shall not be expended for the purchase or repair of any commodity which can be manufactured or repaired at the nearest available government arsenal or navy yard for less.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance* New York

All the markets moved logically last week. Commodities, which are just commencing to reflect the general recovery of confidence, were firm with an upward tendency, but stocks and bonds, some of which were from 30 to 50 per cent over the lowest prices reached, were reactionary.

This was entirely natural. The strongest man grows weary and must rest. No market can advance uninterruptedly and a period of quiescence for the digestion of the enormous bond issues recently placed was long overdue. It appears to have arrived last week and the $75,000,000 Federal Land Bank 20-year bonds which were sold on a 4½ per cent basis in a day seem to have been the *bonne bouche* that created a consciousness of satiety. Subsequent offerings were smaller and were not so well taken and it is said that other issues planned for the near future have been put in cold storage for a while. Concurrently and consequently there was some liquidation of speculatively held stocks which was perhaps accelerated by failure of two relatively unimportant brokerage houses. But in so far as the security markets are concerned the halt was perfectly normal and is not to be construed as indicating any change in fundamental conditions. The course of prices on the Stock Exchange generally foreshadows a commercial revival or contraction.

Revival to Last

The revival in general business that is just beginning has been indicated in the stock market for the last three months. Even if it were destined to be short lived it would continue through the summer and there are many reasons why it should last much longer. Of these the most important is that the nation's shelves are bare and many of its people inadequately housed.

The ease of money has started a movement to correct these conditions that cannot possibly be completed within a year and for that time at least activity will continue and labor will be employed. The stock market will meanwhile go up and down, but no disastrous break is probable until bank reserves and the money market signalize a prospective shortage of credit and even then it is likely that the signals will be for a time ignored.

As justifying this prognosis, there is to be noted continued strength in cotton and cotton goods, wool and woolen goods, wheat and corn, iron, steel and copper, burlaps and jute, silk, linen and flax, hides and leather, and several other less important staples. Coffee is lower because the bearish significance of the Brazilian coffee loan is commencing to be understood, but sugar and rubber, though stationary, are daily getting into a stronger position.

As was the case last week the firmness in each instance is attributed to some technical trade influence or development, but the movement is too inclusive to be adequately explained by technicalities. The broader basis upon which it rests is the abundance of credit that first made it possible to sell billions of bonds and is now reflected in the expenditure of the money received for these bonds for the construction, equipment and goods of which society was in need and in the fabrication of which labor is employed.

A Boom Coming

The cycle that embraces these sequences extends far beyond that within which the stock market moves and as it is altogether unlikely that it will be completed within the year I see no reason to doubt that the business activity due about July 1 will continue through next winter. It is, indeed, quite possible that we may have a secondary boom in the stock market as the money spent gets into circulation and passes back into the banks through the channels of trade.

The possibility of such a boom is perhaps increased by the gain of $10,500,000 in gold shown in the weekly statement of the Federal Reserve System. As a result the reserve ratio is slightly higher at 77.3 per cent against 76.7 at the end of the previous week. This renewed influx of gold is a distinct surprise and if it continues, which seems hardly possible, the advance in interest rates that some expect is likely to be deferred. The merger of Mr. Schwab's Bethlehem Steel Corporation with the Lackawanna Steel Company, involving as it does properties capitalized for nearly $400,000,000, is another incident that may excite the speculative imagination.

For the present the financial world seems a little less disposed to ignore the muddle at Genoa and the various other clouds to which I have previously called attention. Their passing may therefore end the hesitancy that now prevails among the mercurial speculators in the security markets.

For we must never forget that even the blackest clouds are dissipated in time and it is in order to observe that the textile strike seems nearer an end than for some weeks and that an advance of $1 a ton in the price of bituminous coal has already reinvigorated the previously languid effort that the Government was making to settle the coal strike. There is also some reason to hope that President Harding's fabian policy of opposition to the bonus bill may defeat it, though this is doubtful. As to Genoa all that can be said is that the inconclusiveness of the conference leaves things about where they were and that some good and no harm has been done by the exchange of views.

The relative strength of sterling as compared with francs and marks would indicate that the shrewd judges of international credit who dominate the market for foreign exchange do not consider that Great Britain's financial position has been impaired by the imbroglio at Genoa, and in the United States despite the "ancient grudge" there is a feeling that Europe will somehow muddle through if the British Empire stands.

In Germany the complete demonetization of the mark seems only a question of a short time unless she can get a large foreign loan, for according to the statement of May 6 the paper currency outstanding amounted to 141,000,000,000 marks. This is an increase of 10,000,000,000 marks in the last fortnight.

No review of the week would be complete that did not include an allusion to the dinner to which President Harding has invited the chief railway executives of the country. It is reported and believed that he intends to urge an immediate and substantial reduction in freight and passenger rates. If this be true and his recommendation is accepted the effect upon business will probably be electrical, for modern commerce is directly dependent upon transportation and its cost. It is in fact doubtful whether either the business men or the railway officers realize what an increase in both the volume of goods handled and the carriers' net and gross revenue would follow a substantial reduction in rates.

Would Stimulate Business

The earnings of the roads are largely dependent upon the density of traffic and the consumptive power of the country is mainly a question of the cost at which its products can be distributed to its markets.

A reduction in railway rates sufficient to be really appreciable would give a stimulus to business that would be nation wide and it is to be hoped that the President will continue to use the influence of his great office to secure it.

In some cases the present tariff penalizes the enterprise of those pioneers who are trying to develop the remoter sections of the country, by freight charges that exceed the value of the article carried.

The result has been bankruptcy for some of those who are distant from the consuming centers where there is congestion, unemployment and unrest because the cost of transportation is a centripetal influence that prevents the distribution of the population.

Navy Wants Brass

The Navy Department has called for bids covering the following: Naval rolled brass bar, 36,618 lb.; commercial brass bar, 4,976 lb.; cast brass billets, 50 lb.; brass welding rods, 146 lb.; bronze rivet rod, 13,405 lb.; bronze phosphor bar, 20 lb.; bronze manganese bar, 6,062 lb.; copper bar, 1,776 lb.; copper, phosphor ingot, 485 lb.; muntz-metal bar, 3,749 lb.

The Trend of Business Improvement—Plants Resuming

The Commercial Steel Casting Co., Marion, Ohio, manufacturer of open-hearth steel castings, is operating at maximum capacity under the greatest volume of business ever experienced. Work has been commenced on an addition to double the present capacity.

The Motor Products Corporation, Ann Arbor, Mich., has adopted a night schedule of operation at its plant, in addition to regular day work.

The Delaware & Hudson Railroad Co. has resumed operations at its shops at Carbondale, Pa., following a shut down for several weeks.

The Maxwell Motor Co., Detroit, Mich., has added about 1,000 men to its working force during the past fortnight, bringing operations at the plant up to full capacity on an increased working basis of 300 cars a day.

The Perry-Fay Co., Elyria, Ohio, manufacturer of capscrews, bolts, etc., has adopted a full time operating schedule at its plant, giving employment to the regular working force.

The Reading Iron Co., Reading, Pa., has resumed operations at its plant at Birdsboro, Pa., devoted to the production of nails, etc. The mill has been closed down for about twenty-four months.

The Michigan Screw Co., Lansing, Mich., is advancing production at its plant and adding a large number of men to the working force. About 100 automatic screw machines, idle for more than fifteen months, have been placed in service.

The Gardner Motor Co., St. Louis, Mo., has increased production to a basis of 1,500 cars during May, as compared with an output of 1,050 automobiles during April. Additions are being made to the working force.

The Hoover Steel Ball Co., Ann Arbor, Mich., is increasing operations at its plant and about fifty men have recently been added to the working force.

The Dort Motor Car Co., Flint, Mich., has increased production to a basis of 100 cars per day, as compared with an output of 40 cars daily in March. Large additions have been made in the working force and all departments are running full.

The Western Automatic Machine Screw Co., Elyria, Ohio, has adopted a full time operating basis at its plant, giving employment to the regular working quota.

The Railway Steel Spring Co., New York, is increasing production at its plants at Depew and Hudson, N. Y., and at other points. A night shift has been inaugurated in a number of departments and additions made to the working force.

The Slatington Iron and Steel Co., Slatington, Pa., has reopened all departments at its plant, some of which have been closed for more than two years.

The Fox Furnace Co., Elyria, Ohio, has adopted a capacity schedule at its plant, with orders on hand to insure this basis for some time to come.

Dodge Brothers, Detroit, Mich., have increased the working force to about 13,000 men, with all departments running full time, on an average basis in excess of 600 automobiles a day.

The Production Foundries Co., Ann Arbor, Mich., has increased operations to a 100 per cent basis, with full time, full working force employment in all departments.

The Atchison, Topeka & Santa Fe Railway Co., has advanced operations to a full time, six-day week basis at its car shops at Cleburne, Tex., following a five-day week schedule for some time past. Production has also been resumed at the locomotive shops of the local plant.

Jones, MacNeal & Camp have started operations in the new factory at Warsaw, Ind. The company moved from Chicago about a month ago and has been busy setting up machinery and arranging equipment for several weeks. The plant will manufacture electric drills. It is expected that the working force will be gradually enlarged.

Chicago Letter

In general, business conditions in the Western machine tool industry continue to show an improvement and the outlook is very optimistic. Inquiries continue to out-number the amount of orders booked. The recent activities on the part of the automotive industries in buying machine tools, and a report which comes from a reliable source that the Santa Fe Railroad will place a number of orders by June 1, are two of the facts which help make the outlook optimistic at the present time.

Although most plants have not even given a thought to the present coal strike a few of them have stated that they will not be able to continue to sell at the present prices if they are forced to get their coal from the East.

The Chicago, Indianapolis & Louisville is inquiring for a 5-ft. radial drill. The Chicago, Milwaukee & St. Paul is inquiring for a 44-in. vertical boring mill, and a 36-in. lathe. To date the Illinois Central has not made a single inquiry for machine tools, but at the present time is asking for bids on five passenger cars 72-ft. long and has placed an order for 110 tons of bridge steel with the Truscon Steel Co., for use in a bridge at Homewood, Ill. There is also a report that the C. I. & L. has ordered 3,000 tons of rails from the Illinois Steel Company.

The Board of Education of Chicago recently awarded a contract to A. & E. Anderson, 19 South La Salle St., for the construction of a $3,000,000 addition to the Crane High School.

The Bates Valve Co. recently purchased eight hundred feet frontage on 83d St., South Chicago, Ill. They are contemplating the erection of a factory and will consolidate their four plants now located at various points.

The Strongheart Company, 1516 South Wabash Ave. recently purchased from the Stringer Brothers Foundry Co. the two-story factory building at 2944 West Lake St., which will be used for their business.

The Mt. Vernon Car Manufacturing Co., Mt. Vernon, Ill., has awarded a contract to the Hughes-Foulkrod Co., Pittsburgh, Pa., for the construction of a one-story foundry for the production of iron and other metal castings; it is estimated to cost about $250,000 including equipment.

Heald Machine Co. Salesmen Hold Conference in Worcester Plant

A three-day conference of salesmen was held at the office and plant of the Heald Machine Co., Worcester, Mass., May 8, 9 and 10, which was attended by the company's salesmen from all parts of the country. The objects of the conference were to promote a mutual understanding between the men and management, to get a line on business conditions by direct contact with the representatives, and to demonstrate to the men the new machines recently added to the Heald line.

Business sessions were held morning and afternoon, at which the executives of the company addressed the men with reference to the business of the past year, and prospects for the future. Individual problems of the men and their relations to the company were discussed and a general plan of campaign mapped out for the ensuing year and covering all sales problems.

The intervening periods were taken up with tours of inspection about the plant and in detailed study of the construction and capabilities of the new machines. The machines were run under test upon regular commercial work in order that the men might become thoroughly familiar with the set-up and operation of them and thus be in position to advise prospective customers as to what to expect in the way of output.

Recommendations for Education of Engineers

A closer co-operation between schools and colleges of engineering, and the industries which depend on them for educational support, was the recommendation made by the committee on Commercial Engineering of the United States Bureau of Education. The committee held its second conference in the Carnegie Institute of Technology, Pittsburgh, Pa., on May 1 and 2. Three group sessions were held. The first was presided over by George W. Dowrie, dean of the school of business, University of Minnesota; the second by Fred M. Feiker, vice-president of the McGraw-Hill Co., Inc.; and the third by L. W. Wallace, executive secretary of the Federated American Engineering Societies. At the close of the discussion the conference adopted the following report:

"The Conference recommends that colleges of engineering and of business adopt the following procedure in developing business training of engineers and the engineering training of business men;

(a) Secure the co-operation of industry in defining standard terminology and specifications of the requirements of industry.

(b) Analyze the specifications of the requirements of industry to determine what are the fundamentals that must be taught, and organize the instruction accordingly.

(c) Study and experiment with ways and means of discovering native bent and of measuring proficiency, that every student may be guided into a career of maximum achievement.

Business Items

The control of the Republic Truck Co., Cleveland, Ohio, has been acquired by J. O. Eaton and a group of associates, who will operate the factory. The transaction includes the control of the Torbensen Axle Co., also of Cleveland.

The New York office of Etablissments Horstmann, of Paris, France, has been discontinued.

Metal & Thermit Corporation, New York, announces the removal of its Pittsburgh branch office from 1427 Western Ave., to 801-807 Hillsboro St., Corliss Station, Pittsburgh.

The Steel Tank and Pipe Co., capitalized at $250,000 has filed articles of incorporation with the county clerk at Oakland, Cal., and will do a general business in steel, iron and other metal products. Directors are: C. H. Ramsden, 709 Santa Ray Ave., Oakland; W. F. Focha, Piedmont, Cal.; and Claire A. P. Duffie.

Perrine & Maloney, Railway Exchange Bldg., Chicago, have been appointed to handle the products of the Lancaster Steel Products Co., of Detroit, in the Chicago district. The Maynard French Steel Co., Mercantile Library Bldg., Cincinnati, has been appointed representative in that city.

The Auto Disel Piston Ring Co., New Haven, Conn., has recently been incorporated under the laws of Connecticut, to manufacture and sell piston rings, auto and gas engine accessories and devices. The capital stock of the new concern is $25,000, and the incorporators are: J. E. Megson, Catskill, N. Y.; R. D. Smith, Cleveland, Ohio; L. Austin, New Haven. A meeting will be held shortly and the company will begin production soon.

We have received a copy of the first volume of the "Jasco Driller," house-organ of the James Clark, Jr. Electric Co., Inc., of Louisville, Ky. Mr. Clark, who is president of the company, writes an interesting message to users of portable drills; the paper also contains some useful hints on ordering such drills.

Dwight P. Robinson & Co., New York, has been awarded the contract for the construction of a building to accommodate the American exhibits at the Brazilian Centennial Exposition, to be held in Rio de Janeiro beginning Sept. 7. The building, which will be the "unofficial" exhibit building, will be constructed of American materials as far as possible.

The United States Steel Corporation has started the construction of a tube mill at Gary, Ind., which it is reported will cost $15,000,000. It is expected that the plant will be operating by the end of 1922.

Employees of the Deane plant of the Worthington Pump and Machinery Corporation, Holyoke, Mass., celebrated April 21 the forty-first anniversary of entrance of the manager, Charles L. Newcomb, into the employ of the concern.

The Canton Rim Co., has purchased the plant of the F. R. Fortune Tool Co., at Wooster, Ohio. An addition will be made to the present buildings, increasing the production capacity at least 50 per cent.

The American-LaFrance Fire Engine Co., with manufacturing plants in Elmira and Bloomfield, N. J., has moved its offices in New York City from 250 West 54th St., to the Fisk Building at 57th St. and Broadway.

Shipments from the factory of the Franklin Automobile Co., Syracuse, N. Y., during the first twenty days of April were not only greater than those for last year, but also set up a mark that has not been reached before during the same period in the history of the Franklin car.

The Hammond Steel Co., Syracuse, N. Y., has been sold for $50,000 to the Sizer Steel Co., of Buffalo, N. Y., at a receiver's sale. The new company is to be known as the Syracuse Steel Co., but is to be merged with the buying corporation. The Sizer company produces high-grade steel tubing. The Syracuse plant is to be equipped for the production of smaller tubing than the Buffalo plant of the concern.

The Patterson-Kelly Co., manufacturers of heating apparatus, has removed its New York City office to 101 Park Ave.

The Shanklin Equipment Co., Springfield, Mass., has contracted to supply cars of the London Tramways, Ltd., London, Eng., with their machines for the issuance of zone tickets and automatic adding of the fares collected. Alfred L. Chase, chief mechanic, will go to England to install the device, the first lot of which will be shipped in a few weeks.

The McKeesport plant of the National Tube Co., of Syracuse, N. Y., has resumed operations on a 100 per cent production schedule.

Following the merger of the Hudson Motor Car Co. and the Essex Motors, Inc., into one company under the Hudson name, a production schedule has been arranged calling for 24,000 Hudson automobiles, and 25,000 Essex cars during the year. Plant operations will be at capacity.

Personals

FRANK ADAMS, of the Whitin Machine Works, manufacturers of textile machinery, Whitinsville, Mass., has left for a business trip into Mexico.

WILLIAM FERGUSON, of the Whitin Machine Works, Whitinsville, Mass., left recently for Europe, where he will be engaged in the interests of the company for the next three months. Mr. Ferguson, will journey through France, Italy and Spain.

W. W. BRASIER, has been appointed general manager of hardware sales of the Yale & Towne Manufacturing Co., Stamford, Conn. Mr. Brasier has been with the company since 1906.

ROBERT H. NEWMAN, of Bridgeport, Conn., has been appointed temporary receiver of the Morris Metal Products Co., Bridgeport, Conn.

ROBERT C. MORRIS, of New York City, purchased the assets of the Hartford Automatic Parts Co., Hartford, Conn., at the auction held May 3. The purchase price was $350,000, and it is understood Mr. Morris represented the creditors of the company.

HORACE ARMSTRONG has been appointed sales manager of the Armstrong Bros. Tool Co., Chicago, Ill.

W. M. SHEETS, formerly of the Miami Cycle Works, has been made sales manager of the Lomar Manufacturing Co., Middletown, Ohio. Mr. Sheets is well-known in automotive fields.

L. S. LOVE, formerly vice-president and general manager of Barbour, Love & Woodward, New York, has resigned. No announcement of Mr. Love's plans for the future has been made.

R. M. BARWISE, who for the past twelve years has been the Eeastern representative of the Diamond Chain and Manufacturing Co., Indianapolis, Ind., has opened an office and storeroom at 18 Hudson St., New York City. Mr. Barwise will be a distributor for Diamond block and roller chains, custom made sprockets and special chains; also for Philadelphia gears and sprockets.

Obituary

GEORGE M. HOWE, metallurgic expert and author of many books on that subject, died at his home in Bedford Hills, N. J., on May 14. Mr. Howe had been honored by the British Iron and Steel Institute and by Franklin Institute. He was president of the American Institute of Mining Engineers in 1893.

JOHN H. PATTERSON, founder of the National Cash Register Co., Dayton, Ohio, died suddenly on May 7, while enroute to Atlantic City. Mr. Patterson was president and manager of the company which he organized in 1884 and was best known among manufacturers for his industrial philanthropy.

Catalogs Wanted

The Iron City Machine Works, Pueblo, Col., would like to receive catalogs and circulars from manufacturers of iron and steel products, machinery, tools and machine shop equipment. This company recently acquired the plant of the Main Street Machine Shop, in Pueblo.

Forthcoming Meetings

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

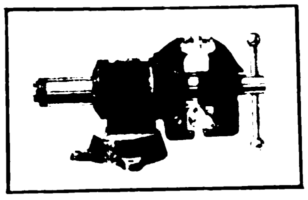
American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

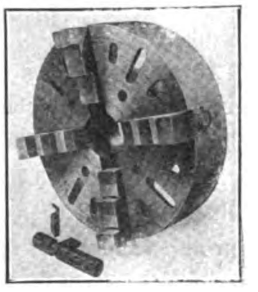
Vise, Machinists', Swiveling Base, "Nutyp"
Atlas Vise Co., Inc., Lowville, N. Y.
"American Machinist," January 26, 1922

The jaws of the vise are 3 in. wide and have an opening of 3½ in. On the opposite side of the screw from the plain jaws is mounted a pair of pipe jaws with a capacity of 1⅜ in. diameter. There is a shearing device for cutting stock ½ in. in diameter. The jaws can be swung about the axis of the screw and locked in any position. The whole vise can be swung about a vertical axis and locked in position. Weight, 40 pounds.



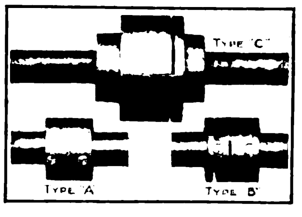
Chuck, Lathe, Steel-Bodied
Cushman Chuck Co., Hartford, Conn.
"American Machinist," January 26, 1922

The chuck is made in sizes from 10 to 30 in. All parts, finished to master gages, are interchangeable. The screws have a greater length of bearing than in the former design. The thrust bearing is made in two parts and completely encircles the screw midway of the screw length. The stem of the thrust bearing is round, is driven into a round hole in the chuck body, and is self aligning. It provides a firm bearing against thrust in either direction. Weight, from 64 to 452 lb., according to size.



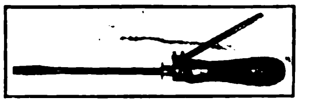
Couplings, Shaft, Flexible, Bartlett
C. H. Breaker, 4226 Broadway, Indianapolis, Ind.
"American Machinist," January 26, 1922

The flexibility of the coupling is derived from a turning motion around pins, and from a sliding motion in a tongue-and-groove construction. The coupling maintains a uniform angular velocity ratio between the two shafts, no matter what the degree of angular or parallel mis-alignment. End float is also allowed. The coupling is made in three types. Type A has one collar pinned directly to one shaft end. Type B has a collar or ring pinned to each shaft end, connected by a groove and slot. Type C has a hub keyed to the end of each shaft; it is made for heavy service, high torque and high speed.



Screwdriver, Lever-Operated, Ratchet
William Roberts, 457 Main St., Springfield, Mass.
"American Machinist," January 26, 1922

By the device, considerable torque may be applied in turning slotted-head screws. The auxiliary handle has a cam-shaped bearing against the shank of the screwdriver. It acts as a ratchet, binds the shank when tightening the screw, and can be operated in either direction. The device is made in several styles, one of which may be attached to and removed from any screwdriver. A split taper collet placed on the shank is clamped by a tapered nut screwed down on it. The ratchet and lever fit on a collar on the collet. The device may be furnished with a hollow head for fitting bolt and socket-wrench heads.

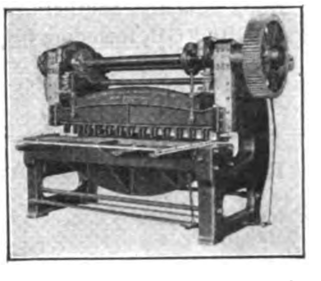


Wrench Set, Socket, Ratchet, H. & G.
Eastern Machine Screw Corporation, New Haven, Conn.
"American Machinist," January 26, 1922

Ten sockets for hexagon nuts from 5/16 to 1 in. in size are provided. A hexagon head is provided on the top of each socket for turning it, all of the wrench parts fitting over this head. An adjustable T-handle is provided. The crossbar in it can be used in a central position for fast work or slid to one side to obtain greater leverage. The ratchet is compact, and may be made either right- or left-hand. An extension piece and a universal joint are furnished. A drop-forged box wrench is included in the set. Each outside part of the wrench attachment has a spring-steel split screw for holding the parts together.

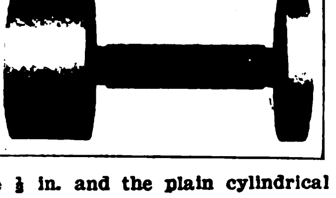
Shear, Gap, Power-Driven
Streine Tool and Manufacturing Co., New Bremen, Ohio.
"American Machinist," February 2, 1922

The machine has a capacity for cutting ⅜-in. and lighter annealed steel plates, and can be furnished in any size. A 15-hp. motor gives a gear reduction of 16 to 1. The flywheel speed is 280 r.p.m., giving 18 strokes per minute of the cutter bar. The cutter bar or crosshead is of box-type construction. The clamp operates automatically. The machine has front, side and back gages and can be arranged for motor drive. Graduations in sixteenths of an inch are marked from the edges of the shear blades to the ends of the front gage supports. With 6-ft. shear blade: floor space, 84 x 120 in.; height, 88 in.; weight, 18,500 lb.



Gages, Plug, Reversible, Large, "Trilock"
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," February 2, 1922

The two gage disks are forced into the ring on a taper before grinding, and grip the central tube. Three prongs on the handle are forced into three grooves in the bushing, providing a three-point, self-centering support. The washer at one end and the handle at the other bear on both the stay-tube and the disks. The gages can be supplied either single- or double-ended, the threaded ones in all sizes above ½ in. and the plain cylindrical gages 5/16 in. and above.



Horning Press, Motor-Driven
Ferracute Machine Co., Bridgeton, N. J.
"American Machinist," February 2, 1922

The press is driven by an electric motor. The motor shaft carries a raw-hide pinion that meshes with teeth cut in the periphery of the flywheel. The horn hole in the frame is 7½ in. in diameter, and 43 in. from the floor. The horizontal distance from the center of the ram to the front of the frame is 11 in. Guides in the vertical front allow the adjustable bed to be affixed at various heights and square with the bottom of the ram. The press is made in five sizes.

Clip, paste on 3 x 5-in. cards and file as desired

The Weekly Price Guide

Rise and Fall of Market

Advances—Sheets, blue, black and galvanized, New York, are quoted 10c. higher throughout the list, Cleveland and Chicago prices remaining firm. Electrolytic Copper is given a higher price of 13.75c up to carlots, at New York. Linseed oil is firm at 95c. New quotations place open hearth spring steel at 4c.; spring steel at 8c., and coppered bessemer rods at 7c.

Declines—Copper sheets fall to 19.25c. when demand becomes slack. Brass and zinc sheets remain firm.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21.50
Northern Basic	23.50
Southern Ohio No. 2	25.02
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.56
BIRMINGHAM	
No. 2 Foundry	17.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	25.40
Virginia No. 2	28.24
Basic	23.50
Grey Forge	24.46
CHICAGO	
No. 2 Foundry local	22.00
No. 2 Foundry, Southern, sil 2.25@2.75	23.92
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.30
Basic	23.00
Bessemer	23.96

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.5	5.0	3.0
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Denver	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.40	3.48	3.15	3.38
No. 12	2.45	3.53	3.20	3.43
No. 14	2.50	3.58	3.25	3.48
No. 16	2.70	3.68	3.35	3.58
Black				
Nos. 17 and 21.	3.00	4.15	3.55	4.10
Nos. 22 and 24.	3.05	4.20	3.60	4.15
Nos. 25 and 26.	3.10	4.25	3.65	4.20
No. 28	3.15	4.35	3.90	4.30
Galvanized steel sheets:				
Nos. 10 and 11.	3.15	4.35	3.75	4.30
Nos. 12 and 14.	3.25	4.45	3.85	4.40
Nos. 17 and 21.	3.55	4.75	4.15	4.70
Nos. 22 and 24.	3.70	4.90	4.45	4.85
No. 26	3.85	5.05	4.60	5.00
No. 28	4.15	5.35	4.90	5.30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	8.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.81	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.70	4.66	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2.58	2.41	2.38
Soft steel bars (base)	2.48	2.31	2.28
Soft steel bar shapes (base)	2.48	2.31	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.58	2.41	2.38
Bar iron (2.00@2.10 at mill)	2.48	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/32	8.00		12@13
1/8	6.50		11@12
5/32 to 1/4	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.75
Tin, 5-ton lots, New York	31.50
Lead (up to carlots), St. Louis, 5.40; New York	5.75
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.75	6.25
Copper sheets, base	19.25	19.50	23.00
Copper wire (carlots)	14@14.25	16.00	16.25
Copper rods (ton lots)	17.75	21.00	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	15.75	17.00	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	13.75	15.00	15.75
Brass wire (carlots)	16.25	17.75	.....
Zinc sheets (casks)	8.00	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	....
Solder (½ and ½), (caselots)	23.00	22.00	19.00
Babbitt metal (fair grade)	30.80	39.50	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	11.75	10.25
Copper, heavy, and wire	9.50	10.75	9.25
Copper, light, and bottoms	8.50	9.00	8.25
Lead, heavy	3.75	4.50	3.65
Lead, tea	2.75	3.25	3.00
Brass, heavy	5.75	6.00	8.00
Brass, light	4.25	4.50	4.75
No. 1 yellow brass turnings	5.00	5.50	5.00
Zinc	2.75	2.50	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@ .09	.09	.09
Wiping cloths per M., 13½x13½	....	50.00	55.00
Wiping cloths per M., 13½x20½	....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.95	.95	1.04
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville...per net ton		$3.25@$3.50	
Coke, prompt foundry, Connellsville...per net ton		$4.25@$4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	55%	60–10%	60%
1⅛ and 1¼x3 in. up to 12 in	40%	60-10-10%	60-10%
With cold punched sq. nuts	40%	....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	.....	$4.00 off
Button head bolts, with hex. nuts	30%	$3.90 net	.....
Hex. head and hex. nut bolts	35%	....	65-5%
Lag screws, coach screws	55%	....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	45%	60-10%	50–5%
Bolt ends, with hot pressed nuts	55%	....	55%
Tap bolts, hex. heads	+10–15%	....	.....
Semi-finished nuts ⅝ and larger	70%	75–10%	80%
Case-hardened nuts	65%	....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	2.50	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	2.50	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	2.50	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	2.50	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	60-10%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.70	$3.25	$3 00
Cone heads, ditto (net)	3.80	3.35	3.10
1¼ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	....	0.15
⅝ in. diameter *EXTRA*	0.15	....	0.15
½ in. diameter *EXTRA*	0.50	....	0.50
1 in. long, and shorter *EXTRA*	0.50	....	0.50
Longer than 5 in *EXTRA*	0.25	....	0.25
Less than 200 lb *EXTRA*	0.50	....	0.50
Countersunk heads *EXTRA*	0.35	......	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40 10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Cal., Los Angeles—The Mission Co., 743 North Main St.—complete line of small machine tools for machine shop.

Col., Pueblo—The Iron City Machine Wks.—catalogues and circulars describing machines, tools and material for use in machine shop.

Ill., Chicago—The Donahue Steel Products Co., 202 North Jefferson St.—one threading machine, 2 in. capacity, 2 spindle; upsetting and forging machines (Ajax) 1½ in.-2 in. and 5 in.

Kan., Baxter Springs—W. A. Goodwin—drill press, prefer Spider or Armstrong.

Kan., Crestline—C. Brown—power trip hammer, 25 lb. for machine shop.

Kan., Galena—J. F. Byrd, 310 Short St.—power lathe for garage.

Kan., Galena—Outt & Livingston, 217 West 7th St., C. N. Outt, Purch. Agt.—power drill press and lathe.

Mass., Worcester—The G. C. Whitney Co., 67 Union St.—one 6 x 10 in. die stamping press, Waite preferred, (used).

Mich., Detroit—Lamb Co., 1938 Franklin St.—punch presses, No. 2 or No. 3.

Mich., Pontiac—The Nelson-Bordie Trap Co.—two punch presses, one large and one medium.

Mich., Wyandotte — Diamond Spring Bumper Co., manufacturers of automobile bumpers—combination punch and splitting shear for punching ⅜ stock, ⅜ in. hole.

Mo., Joplin—Belcher & Pettit, 2nd-Joplin Sts.—power lathe, drill press, emery wheel and cylinder grinder for garage.

Mo., Joplin—F. Boyer, East 4th St.—one power lathe.

Mo., Joplin—Cather & Lauderbaugh, 207 Main St., C. Cather, Purch. Agt.—equipment for garage including power lathe and drill press.

Mo., Joplin—F. & P. Garage, 114 Virginia Ave., W. A. Adams, Purch. Agt.—one 40 ton arbor press.

Mo., Joplin—T. S. Maitland, P. O. Box 443 Joplin—power lathe.

Mo., St. Louis—Brown Mchy. Co., 2323 N. 9th St.—coping lathes.

Neb., Lincoln—The Dowling Iron Wks., 204 South 9th St.—punch and shear for structural sections also overhead carrier system.

Neb., Lincoln—The Lincoln Plating Co., 1218 Q St., (sheet metal works), C. F. Moore, owner—cylinder grinder, 18 in. lathe, belting, etc.

Neb., Lincoln—The Taylor Electric Co., 330 South 10th St., F. E. Taylor, Purch. Agt.—lathe, 10 in. swing, 5 ft. bed, bench legs, large spindle and head stock bearing with compound rest and draw in collet.

N. J., Perth Amboy—The Seaboard Refractories Co., Valentines St.—18 in. x 8 ft. lathe.

N. Y., Binghamton—Engbers & Son, 396 Chenango St.—power driven sheet metal working tools including formers, edgers and trimmers.

N. Y., Buffalo—The Natl. Biscuit Co., 217 Ellicott St.—tools and equipment for the repair of auto trucks at garage 213-215 Ellicott St.

N. Y., Buffalo—J. A. Sanders, 115 Lathrop St.—sheet metal working machinery.

N. Y., Charlotte (Rochester P. O.)—H. C. Garrett & Co.—machinery and equipment for small machine shop on Stutson St.

N. Y., Gloversville—H. S. Lawphere, 52 Fremont St., manufacturers of heating, ventilating and sheet metal—sheet metal working tools and equipment, power operated.

N. Y., Jamestown—O. T. Colander, 175 McKinley Ave.—small tools and equipment for proposed garage and repair shop.

N. Y., Jamestown—Jamestown Metal Desk Co., C. H. Dasher, Purch. Agt.—drill presses, punch presses, one lathe, and other small equipment for metal furniture plant.

N. Y., Romulus—The Troutman Garage Co., H. Troutman, Purch. Agt.—complete machinery and tools for motor repair, incl. forge and blower.

O., Columbus—Sulzee Battery & Equipment Co., 296 East Long St., L. E. Sulzee, Secy. and Genl. Mgr.—equipment for auto service including lathe, press and grinder.

O., Columbus—The Columbus Auto Brass Co., 767 North 4th St., T. Ash, Supt.—machinery for repair shop including lathe, shaper, two drill presses and two grinders.

Okla., Hockerville (Kansas P. O.)—The State Line Garage, W. H. Hogen, Purch. Agt.—power lathe, drill press and emery wheel.

Okla., Picher—The Big Four Garage, H. W. Jameson, Purch. Agt.—power lathe.

Okla., Picher—The Tri State Motor Co., A. L. Kinney, Purch. Agt.—power lathe and drill press.

Pa., Canton—The Keystone Garage Co., R. Brann, Purch. Agt.—complete machine tool equipment for service garage and for repairing gasoline motors.

Pa., Carnegie—The Union Tool Co.—one 72 in. vertical boring mill and one 5 ft. radial drill.

Pa., Erie—H. C. Cowley, 1139 East 28th St.—one 14 in. lathe and one small grinder.

Pa., Johnstown—The Cosgrove Coal Co.—horizontal boring mill, 20 in. engine lathe, hexagon turret lathe, centerless grinder, drill grinder, 24 in. shaper, 4-5 ft. radial drill, 2 wheel grinders, 200 ton hydraulic wheel press, Universal milling machine 2 or 3 spindle sensitive drill press, 2 head wheel turning lathe to swing 36 in. Above equipment to be purchased for Cherry Tree Machine Co., Cherry Tree, a subsidiary company.

Pa., Meadville—The Champion Tool Co.—machinery and equipment for new plant on South Main St.

Pa., Pittsburgh—Acme Stamping & Mfg. Co., 207 Corliss St.—one double crank geared press—size 3A, Bliss; one Toggle press, size 3½A Bliss, (used).

Pa., Sharon—The Sharon Pressed Steel Co.—one large die grinder.

Pa., Waynesboro—The Frick Co., Inc., West Main St.—24-26 in. type C Libbey turret lathe, 4½ in. hole through spindle with countershaft; No. 0 Avey high speed ball bearing sensitive drill, ⅜ in. spindle, capacity ⅜ in. bored for No. 1 Morse taper.

Tenn., Chattanooga—M. B. Parker, 1921 Oak St.—motor driven drill press about 42 in.

Tenn., Knoxville—The Sanford Day Iron Wks.—one double end punch and shear.

Wis., Eau Claire—J. Everson, 311 West Madison St.—equipment for auto repair shop.

Wis., Green Bay—W. J. McGinnis, 338 South Adams St.—equipment for auto repair shop.

Wis., Hartford—The International Stamping Co., c/o A. F. Schauer,—stamping machines.

Wis., Manitowoc—K. O. Muehlberg Co., 209 North 9th St.—equipment and machinery for proposed machine shop on 17th and Franklin Sts.

Wis., Milwaukee—The Arpe Motor & Sales Co., 39th and Fond du Lac Ave., E. A. Arpe, Purch. Agt.—lathe, drill press and two motors.

Wis., Milwaukee—A. Schwope, 557 California St.—drill press and 4 in. machinist's vise.

Ont., Welland—The Lackawanna Tubes, Ltd., F. L. McCallum, Purch. Agt.—lathes, planers, shapers, drill presses and large roll lathes.

Que., Montreal—The Bramon Taxi Service, Phillips Pl., L. Bramon, Purch. Agt.—machinery and equipment for garage.

Machinery Wanted

Col., Colorado Springs—A. J. Kiser, Burns Bldg.—power press for newspaper plant.

Col., Seibert—Settler the Printer, 6 column newspaper press.

Conn., East Norwalk (South Norwalk P. O.)—The Norwalk Mfg. Co., 214 East Ave.—one silk doubling machine, one 64 spindle winding machine and several braiding machines for silk goods.

Fla., Ft. Meade—The Ft. Meade Development Bd., L. A. Morgan, Mgr.—machinery, equipment, etc., for canning plant.

Fla., Wauchula—H. Stansfield—ice manufacturing machinery for cold storage plant, (new or used).

Fla., West Palm Beach—The Palm Fibre Co.—machinery for cleaning fibre, spinning, twisting and balling also for weaving into mats and burlap.

Ill., Chicago—E. M. Heller & Co., 144 West Kinzie St.—one 10 ton York ammonia compressor, with or without condenser and coils; and one single drum, 6,000-lb. hoist, with 3 phase, 60 cycle, 440 volt motor, direct current.

Ill., Chicago—The Royal Auto Body Co., Inc., 3727 Cottage Grove Ave.—cutoff saw and other woodworking machinery.

Ill., Chicago—The Self Adjusting Spring Co., 4925 South Halstead St., A. Allen, Purch. Agt.—additional machinery for the manufacture of automobile springs.

Ill., Chicago—The Western Newspaper Union, 210 South Desplaines St.—Ludlow press, (used).

Ill., Rockford—J. Redin, 1026 Charles St.—one chain hoist.

Ill., Rockford—The Rockford Electric Co., 114 South Wyman St.—condenser and small crane.

Ia., Ft. Dodge—Bd. Educ., P. E. Gustafson, Dir.—will receive bids until May 22 for print shop equipment, woodworking machinery and sheet metal shop equipment for new high school.

Kan., Baxter Springs — The Baxter Springs Herald, P. L. Keener, Purch. Agt.—power newspaper press and job paper cutter for power equipment.

Kan., Baxter Springs—Chanute Smelter Co., D. Peck, Purch. Agt.—belting, shafting, pulleys, hangers, bearings, ore grinders, etc., for new ore concentration mill. Estimated cost $50,000.

Kan., Baxter Springs—F. M. Congdon & Sons, 1323 Park Ave., F. M. Congdon, Purch. Agt.—power band saw.

Kan., Baxter Springs—W. P. Howard—oil drill rig.

Kan., Baxter Springs—J. Keith—power lathe and drill press for blacksmith shop.

Kan., Galena—C. Graham—power lathe for machine shop.

Kan., Galena—The Standard Oil Co., H. C. Porter, Purch. Agt.—oil filtering machinery.

Kan., Galena—M. S. Stillson, 10th St. planing mill—one 10 in. planer and cut off saw for power equipment.

Kan., Nicholasville—The Farmers Dairy Co., c/o J. T. Edwards—machinery and equipment for new dairy.

Kan., Scammon—The Skidmore Pump Co.—crushing machinery and coal crusher.

Ky., Mt. Sterling—The Hon Packing Co., E. T. Hon, Purch. Agt.—machinery and equipment for packing plant.

Ky., Princeton—The Princeton Tobacco Co., Inc., J. Ross, Pres.—machinery and equipment for the manufacture of tobacco products.

Md., Towson—The Baltimore Printing & Bindery Co.—stereotyping outfit and printing equipment.

Mass., Taunton—The H. J. Collis Co., manufacturer of athletic and sporting goods, etc.—two rivet machines, tubular rivet and stud machines that can be used for attaching ice skates on skating shoes, (used).

Mass., West Stoughton—French & Ward, manufacturer of worsted and woolen goods—stretching machine for 40 in. and up heavy fabric material, (used).

Mich., Cadillac—D. Catts, printer—sawing equipment for sawing metal by power; mailer and 10 x 15 Gordon Press.

Mich., Detroit—A. T. Tubbs, 5233 Tillman Ave.—one 8 in. sticker, one tennon machine and one sander.

Mich., Wyandotte—The All Metal Products Co., Labadie St.—one wood band resaw for machine shop.

Minn., Princeton—The Princeton Cooperative Creamery Assn.—power machinery and equipment for new creamery.

Mo., Butler—The Higley Printing Co.—10 x 15 job printing power press for motor equipment.

Mo., Joplin—J. Bangher, 715 Virginia Ave.—power combination planer and a band saw, Sidney machine preferred.

Mo., Joplin—The Braeckels Planing Mill, 1201-1203 Wall St., M. J. Braeckel, Purch. Agt.—Morgan camera lock—corner machine for power machinery.

Mo., Joplin—W. T. Hadley, 817 Main St., mining machinery—2 switches, one Y, 16-20 lb. rails, belt driven hoist, 20 sets wheels and axels, 36 in. gauge, 20 set 12-16 in. wheels, 60 hp. fire box boiler, 40 hp. steam engine, 800 ft. belting and shafting.

Mo., Joplin—Joplin Pleating & Button Mfg. Co., 721 Main St., H. T. James, Purch. Agt.—one cutting and one clinching machine for power equipment.

Mo., Joplin—Joplin Overall Co., 2nd and Joplin Sts.—belting, shafting, sewing machine and cloth cutter for power factory.

Mo., Joplin—The Ozark Magazine, 820 Pearl St., L. J. Mane, Purch. Agt.—power folding and power stapling machines.

Mo., Joplin—Shafer-Cave Creamery Co., 13th and Main Sts., C. C. Shafer, Purch. Agt.—creamery equipment including belting, shafting, hangers, pulleys, and other supplies. Estimated cost $5,000.

Mo., St. Louis—R. W. Baskeville, 2316 Walnut Street—Printing press.

Mo., St. Louis—The Campbell Printing Co., 206 Oliver St.—power 26 in. paper cutter for job printing work.

Mo., St. Louis—The Censor Co., Suite 1273 Arcade Bldg.—equipment for a daily newspaper plant.

Mo., St. Louis—Downing & Co., 405 Equitable Bldg.—one power buffer and one grinding machine.

Neb., College View—G. W. Hudson, shoe repair shop—welt roller, stitching impression machine and crow nailer.

Neb., Lincoln—Graham Printing Co., 118 South 15th St., C. H. Graham, Purch. Agt.—one 12 x 18 printing press and a 26 inch hand cutter.

Neb., Lincoln—The Shamp Filling Station, 13th and High Sts., C. E. Shamp, Purch. Agt.—small compressor.

N. Y., Adams Center—W. Alexander, Main St.—swing cut off saw and table, also shingle making machinery.

N. Y., Binghamton—Binghamton Limestone Co.—complete equipment for saw mill and grist mill.

N. Y., Brooklyn—L. Mundet & Son, 65 South 11th St.—mixing machine, Day preferred.

N. Y., Buffalo—W. Hill, 134 Claremont Ave.—machinery for manufacturing auto parts, proposed factory at 2211 Elmwood Ave.

N. Y., Buffalo—The Martha Washington Laundry, 1468 Main St.—laundry machinery and equipment for proposed building at 1462 Main St.

N. Y., Buffalo—H. Wolcott, 3042 Main St.—charging machinery for small shop to be erected on Main St.

N. Y., Cohoes—F. Gilbert Paper Co., Saratoga and Spring Sts.—wood pulp grinding machinery (3 or 4 pocket grinders).

N. Y., Croghan—The Adirondack Garment Co., F. J. Nortz, Purch. Agt.—shafting, pulleys, transmission equipment and dye house machinery.

N. Y., Edwards—The Northern Ore Co.—electric haulage equipment for underground mine material transportation.

N. Y., Franklinville—The Ontario Cutlery Co., Inc.—machinery and equipment for proposed cutlery plant.

N. Y., Gouverneur—The Gouverneur Limestone Co., H. H. Hodgkin, Purch. Agt.—electrically operated stone saw.

N. Y., Long Island City—The Manhattan Box Co., Nelson Ave.—lifting truck and platform.

N. Y., Massena—The Northern Coca Cola Bottling Wks., F. Pellagrina, Purch. Agt.—bottle filling, washing and capping machinery.

N. Y., Newark—Phillips-Werth Optical Co., Willow Ave. and Main St.—machinery for proposed optical factory.

N. Y., New York—Drydock Fixtures, 359 Bowery—combination saw table with borer attachment, a.c. motor.

N. Y., New York—The Liberty Dry Dock & Repair Co., 16 Bridge St.—hoisting engine, upright boiler, air compressor and stiffleg.

N. Y., New York—The Logan Constr. Co., 15 Park Row—compressor, single stage, horizontal, about 125 ft. long.

N. Y., North Collins—The Auto Steamulator Co., Inc., c/o F. A. Diadato—machinery and equipment for the manufacture of engines, etc.

N. Y., Ogdensburg—E. J. Boyer, Natl. Bank—machinery and equipment for the manufacture of metal curtain rods.

N. Y., Olean—The Acme Milling Co., Inc.—machinery and equipment for new feed mill at Allegany.

N. Y., Oneida—The Van Wheel Corp.—woodworking machinery and equipment.

N. Y., Phelps—The Phelps Fruit Growers Assn.—machinery for proposed fruit packing plant on Ontario St.

N. Y., Rochester—The Empire Welding Wks., 1387 Dewey Ave., C. G. Zimmerman, Purch. Agt.—acetylene welding, brazing and cutting tools and equipment for shop.

N. Y., Rochester—B. Kovalski, c/o Weiss-Knopf Clothing Co.—machinery and equipment for proposed clothing factory at Williamson.

N. Y., Rochester—The Northeast Electric Co., 348 Whitney St.—No. 10 American variety saw table, (new or used).

N. Y., Sackets Harbor—C. Gamble Co., Ambrose St.—double surface planer and electric sanding machine.

N. Y., Schenectady—Mary Ann Creek Mining Co. Inc., 469 State St., W. F. Wellman, Purch. Agt.—Ball (or equal) fine grinding machines, cyanide oil flotation equipment, rock drills, air compressors and rock handling equipment.

N. Y., Sherman—D. M. Bockcock—tinsmithing tools for new plant.

N. Y., Syracuse—Hayes & Whitbread Foundry, 136 Richmond Ave.—machinery and equipment for foundry.

N. Y., Watertown—F. A. Jessine, 870 Arsenal St.—special machinery for the manufacture of hair clippers.

N. Y., Watertown—The Wright Bros. Co., 518 Mohawk St., C. Wright, Purch. Agt.—machinery and equipment for splitting, curing, tanning, cutting and pressing leather, also all machinery for the manufacture of leather.

N. C., Akron—The General Stone Co.—rotary crusher for limestone.

N. C., High Point—The Ellison Furniture Co., C. H. Ellison, Secy.—several mortising machines, (used).

N. C., Raleigh—J. D. Whitaker, 220 E. Park Dr.—one double drum hoisting engine and one boiler, about 15 horse power, in good condition, (used).

N. C., Warsaw—E. B. Hinman, box manufacturing machinery for the manufacture of boxes, barrels, etc., (new or used).

O., Cleveland—The Kirk-Latty Co., 1971 West 85th St., S. D. Latty, Pres.—coal and ash conveying machinery, also two 150 hp. and 60 hp. water tube boilers and two 150 hp. stokers.

O., Cleveland—C. J. Pfeil Co., 1976 West 3rd St.—additional machinery for woodworking plant addition.

O., Columbus—Continental Clay Co., Ferris Bldg., C. E. Berridge, Secy. & Treas.—dryer and other brickmaking machinery for plant No. 2, at East Greenville.

O., Columbus—Franklin Brick & Tile Co., Ferris Bldg., R. S. Dingledine, Secy. and Treas.—continuous kiln equipment.

O., Columbus—E. A. Prentice Lumber Co., Vine and Armstrong Sts., E. A. Prentice, Pres.—several kinds woodworking machines.

O., Piqua—W. R. Howe, 618 North Wayne St.—five automatic knitting machines, 20, 24, 26 and 28 in. needle bed, 12 cut, Dubied, Lamd, or Grosser make, (used).

Okla., Apache—J. C. Nagel (Apache Review)—power press for newspaper plant.

Okla., Chickasha—The Daily Express, G. Evans, Purch. Agt.—linotype and other newspaper equipment.

Okla., Hockerville—The Blue Ribbon Mining Co., H. Hawkens, Purch. Agt.—shafting, pulleys, belting and rock crushers for concentration zinc mill.

Okla., Picher—The Picher Planing Mill, H. A. Brocksmith, Purch. Agt.—complete line of planing mill equipment, including power planer, band saw, and sander for plant at Baxter Springs, Kan.

Okla., Picher—The Picher Times, E. E. Sanders, Purch. Agt.—newspaper cylinder press and job press for power equipment.

Okla., Tulsa—The North American Car Co. (manufacturer of railroad cars)—air compressor and motor.

Pa., Erie—W. Blesser, 142 East 12th St.—good size air compressor.

Pa., Marienville—The Marienville Glass Plant—machinery and equipment for proposed glass plant.

Pa., Phila.—The City—ash and coal handling equipment for Queen's Lane plant. Estimated cost, $25,000.

Pa., Phila.—The Pooley Furniture Co., Inc., 17th and Indiana Sts., M. Pooley, Purch. Agt.—36 in. band saw for power machinery.

Pa., Pittsburgh—Pittsburgh Reinforced Brazing & Machine Wks., 2525 Liberty Ave.—two 10 ton cranes.

Pa., Sharon—The Sharon Furniture Mfg. Co., J. Canteloupe, Vice Pres.—full machinery and equipment for furniture manufacturing.

S. C., St. George—The County Record Co., W. S. Stoke, Mgr.—equipment for small newspaper plant, also job printing press, (new or used).

S. C., Union—The Bailey Undertaking Co., T. E. Bailey, Pres.—light woodworking machinery for making caskets, such as rip and cutoff saws, scroll saws, jointers, sanders, tenoners, and small oil burning boiler (new or used).

Tenn., Knoxville—The Appalachian Marble Co., Inc., Marblebrooke Park—300-500 cu. ft. capacity, motor driven, air compressor.

Tenn., Knoxville—The White Oak Corp., H. T. Spencer, Pres.—complete woodworking machinery, metal working lathe, shaper or planer, radial drill, power hack saw and oxy-acetylene cutting and welding outfit.

W. Va., Beckley—The Raleigh Register, (newspaper and job printers), C. Hodel, Purch. Agt.—one 17 in. backing machine.

W. Va., Iaeger—The Pocohontas Red Ash Coal Corp., J. G. McGowan, Mgr.—mining machinery including No. 6 figure 8 incline drum, electric scraper loaders, electric hoists and smaller tools, (new or used).

W. Va., Princeton—The Princeton Bldg. Material Co., Inc., N. J. Jenkins, Genl. Mgr.—single end tennoring machine with copies; hand-feed rip saw or variety saw with expansion mandril; Philips window frame machine No. 3; glue jointing machine, solid heads; (new or used).

Wis., Glendale—The Glendale Milling Co., J. Slodek, Purch. Agt.—flour mill machinery.

Wis., Manitowoc—A. Fischl Dairy Co., 1421 Marshall St.—ice cream machinery and equipment.

Wis., Merrill—W. Savidusky—complete laundry machinery, belt driven.

Wis., Milwaukee—The Milwaukee Hosiery Co., 520 State St., W. J. Zens, Purch. Agt.—power operated looping machines.

Wis., Milwaukee—The Milwaukee Wet Wash Laundry, 1515 Cherry St., F. Lukuf, Purch. Agt.—laundry machinery, driven by steam power.

Wis., Milwaukee—C. Stolper Cooperage Co., 3300 Fond du Lac Ave., C. Stolper, Purch. Agt.—one saw table complete with gasoline engine.

Wis., Milwaukee—B. A. Weserski, 583 15th Ave., (carpenter and woodworker)—door polishing machine equipped with 2 or 3 drums.

N. B., Fredericton—The Chestnut Canoe Co., J. Walker, Purch. Agt.—sawing, moulding and planing machinery and other equipment.

Ont., London—The International Creamery Co., Detroit, has purchased local abattoir and will install complete equipment for the manufacture of dairy products and ice cream. Estimated cost, $40,000.

Ont., Port Arthur—Richardson & Sons, Ltd., elevator manufacturer, J. Richardson, Purch. Agt.—complete equipment for 1,500,000 bushel elevator.

Ont., St. Williams — McCall Bros. — special wood working machinery for furniture factory.

Ont., Simcoe—The Non Freeze Battery Mfg. Co., R. W. Wallace, Pres.—machinery and special equipment for the manufacture of non freeze batteries.

Ont., Toronto—The Canada Ruler & Novelty Co., W. Hunt, Mgr.—additional woodworking equipment for proposed factory at Galt.

Ont., Welland—The Empire Cotton Co., Ltd., A. D. Payne, Secy.—machinery and equipment for new $250,000 addition to cotton mill here.

Que., Montreal—Millen, Freres, 288 Gouin Blvd. E., manufacturer of sash and doors, J. Millen, Purch. Agt.—complete machinery for planing mill.

Metal Working Shops

Cal., Gilroy—A. Ellis is having plans prepared for the construction of a 1 story garage. Estimated cost, $40,000. W. H. Weeks, 369 Pine St., San Francisco Archt.

Cal., Oakland—The Magnovox Co., 2725 East 14th St., has awarded the contract for the construction of a 2 story, 60 x 200 ft. factory on East 14th St., for the manufactpre of telephones and land speaking devices. Estimated cost, $60,000. Noted May 4.

Cal., Richmond—The Santa Fe Fdry. Co., D and Clinton Sts., has awarded the contract for the construction of a 1 and 3 story foundry on D and Clnton Sts. Estimated cost $100,000. G. W. Penning Mgr.

Cal., San Francisco—The Brumfield Electric Sign Co., 18 7th St., plans to build a 2 story plant for the manufacture of electric signs. Estimated cost, $10,000. Architect not selected.

Cal., San Jose—Temple & Syer, c/o Wolfe & Higgins, Archts., Auzerais Bldg., is having plans prepared for the construction of a 2 story, 96 x 137 ft. garage on 2nd St.

Cal., Stockton—F. A. McCan, c/o David-Heller-Pearce, Archts., Delta Bldg., has awarded the contract for the construction of a 2 story, 75 x 100 ft. garage on California St. Estimated cost, $50,000.

Cal., Vallejo—The Western Die Casting Co., 2927 Newbury St., Berkeley, plans to build a plant here for the manufacture of Winslow carburetors. Estimated cost $45,000.

Col., Pueblo—The Iron City Machine Wks. has acquired the business formerly conducted by the Main St. Machine Shops and plans to improve and enlarge its shop.

Conn., Springdale—The Segal Metal Products Co. will soon receive bids for the construction of 1 story, 40 x 45 ft. foundry and a 3 story, 30 x 120 ft. mahcine shop. Lockwood-Greene Co., 101 Park Ave., New York, Archts. and Engrs.

Conn., Waterbury—The Connecticut Light & Power Co., Lakeville St., will build a 4 story, 60 x 133 ft. garage and storage plant on Freight St. Estimated cost, $100,000. Noted May 11.

Ky., Louisville—H. Madler and M. J. Toule, Selbach Hotel are promoters of a new company which is having plans prepared for the construction of a 4 to 10 story, 150 x 200 ft. garage on 5th and Chestnut Sts. Estimated cost, $250,000. Address J. H. Button Co. 418 West Jefferson St. D. X. Murphy & Bro., 714 Louisville Trust Bldg., Archts.

Mass., Springfield—S. J. Cordner, 22 Taylor St., has awarded the contract for the construction of a 1 story, 60 x 220 ft. garage on North Main St. Estimated cost, $55,000.

Neb., Lincoln—The Dowling Iron Wks., 204 South 9th St., plans to build an addition to its plant, containing 2,500 sq.ft. floor space.

N. J., Hoboken—Fischer-Sweeny Bronze Co., 312 Adams St., will soon receive bids for the construction of a 1 and 2 story, 100 x 200 ft. foundry on 13th and Grand Sts. Estimated cost, $80,000. Lockwood-Greene & Co., 101 Park Ave., New York,, Archts. and Engrs.

N. Y., Binghamton—T. H. Wilbur & Son will build a 1 story, 38 x 96 ft. machine shop at 23-25 Wall St. Estimated cost between $10,000 and 12,000.

N. Y., Buffalo—The Cleveland Cold Drawn Steel Co., 503 Leader News Bldg., Cleveland, O., plans to build a 1 story steel plant along the tracks of the South Buffalo R.R. here. Estimated cost, $1,000,000. C. H. Hopkins, Secy.-Treas. Private plans.,

N. Y., Buffalo—S. Dozeretz, 258 East Ferry St., plans to build a garage and office on Ferry St., E. Estimated cost, $40,000. Architect not announced.

N. Y., Buffalo—McKaig & Hatch, Inc., 1584 Niagara St., plans to build a machine shop on Skillen and Ontario Sts. Estimated cost, $16,000. Architect not announced.

N. Y., Hornell—The Erie R. R., 50 Church St., New York, plans to build an addition to its repair shop here. Estimated cost between $200,000 and $225,000. Address J. Gravis, Hornell, Asst. Div. Engr.

N. Y., New York—The 36th St. Garage Corp., c/o Block & Hesse, Archts., 18 East 41st St., will soon award the contract for the construction of a 3 story, 75 x 100 ft. garage at 103 West 108th St. Estimated cost, $150,000.

O., Cleveland—Alexander Szabo, 1603 Woodward Ave., Lakewood, will soon award the contract for the construction of a 1 story, 40 x 120 ft. garage at 4122 Lorain Ave., here. Estimated cost, $40,000. W. H. Nicklas, 1900 Euclid Ave., Archt.

O., Toledo—J. Ryan has awarded the contract for the construction of a 1 story, 100 x 100 ft. garage and store on 20th and Adams Sts.

Pa., Erie—The Odin Stove Mfg. Co., Inc., is receiving bids for the construction of a 1 story, 26 x 122 ft. stove factory on West 12th St. Estimated cost, $10,500. Architect not announced.

Pa., Phila.—The Central Constr. & Supply Co., 2220 Arch St., will soon receive bids for the construction of a 1 and 2 story, 228 x 350 ft. plant on 53rd and Florence St., for the manufacture of builders and contractors supplies. Estimated cost, $80,000. Private plans.

Pa., Phila.—L. B. Rothchild, Archt., 1225 Sanson St., is receiving bids for the construction of a 5 story, 55 x 160 ft. sales and service station at 1409 North Broad St., for J. J. Greenberg, Morris Bldg. Estimated cost, $200,000. Noted May 4.

Pa., Phila.—C. Zeisloft has awarded the contract for the construction of a 1 story, 100 x 117 ft. garage on Ridge Ave. and Lyceum St. Estimated cost, $60,000. Noted March 2.

Wis., Eau Claire—J. Everson, 311 West Madison St., has awarded the contract for the construction of a 1 story, 50 x 65 ft. garage. Estimated cost, $40,000.

Wis., Green Bay—W. J. McGinnis, 338 South Adams St., has awarded the contract for the construction of a 1 and 2 story, 50 x 95 ft. garage on North Adams St. Estimated cost, $45,000.

Wis., Madison—W. F. Clark, 2105 Keyes Ave., has awarded the contract for the construction of a 1 story, 60 x 186 ft. garage, etc., on University St. Estimated cost, $40,000. Noted May 4.

Wis., Manitowoc—The Hamacheck-Bleser Co., 11th and Franklin Sts., has awarded the contract for the construction of a 1 story, 50 x 139 ft. garage. Estimated cost, $50,000.

Wis., Manitowoc—K. O. Muehlberg, Co., 209 North 9th St., has awarded the contract for the construction of a 2 story, 35 x 70 ft. machine shop on 17th and Franklin Sts. Estimated cost, $45,000.

Wis., Wausau—D. J. Murray Mfg. Co., manufacturer of saw mill machinery, will soon award the contract for the construction of a 1 story, 62 x 228 ft. machine shop. E. C. Hall, 221 Grand Ave., Engr.

Ont., Pt. Colburne—The International Nickle Co. is receiving bids for the construction of a 90 x 140 ft. nickle plant. Architect not announced.

General Manufacturing

Cal., San Francisco—L. R. Lurie, Flatiron Bldg., has awarded the contract for the construction of a 2 story baking oven plant on Howard St. near 4th St. Estimated cost, $11,000. Bake-Rite Oven Mfg. Co., lessee.

Cal., San Jose—J. F. Pyle & Sons, King Rd., have awarded the contract for the construction of a pre-cooling plant on 5th and Lewis Sts. Estimated cost, $7,500.

Cal., San Jose—The Stewart Fruit Co., Wells Fargo Bldg., has awarded the contract for the construction of a 1 story addition to its fruit packing plant on Bassett St. Estimated cost, $5,000.

Conn., Hamden—The Natl. Filter Cloth & Weaving Co., 57 Hope St., Brooklyn, N. Y., has awarded the contract for the construction of a 1 story, 70 x 192 ft. factory on Dixwell Ave. and Mather Sts., here. Estimated cost, $60,000. Noted March 16.

Conn., Hartford—The Capitol City Glass Co., Chapel St., is receiving bids for the construction of a 2 story, 40 x 150 ft. addition to its factory. Estimated cost, $40,000. F. C. Walz, 407 Trumbull St.. Archt.

Conn., Norwalk—C. H. Harris, Inc., Main St., has awarded the contract for the construction of a 1 story, addition to glass factory on Main St. Estimated cost, $40,000.

Ind., Fort Wayne—The Craig Biscuit Co., 115 Montgomery St., is having plans prepared for the construction of a 4 story factory. McCormick Co., Inc., 41 Park Row, New York City, Archt. and Engrs.

La., Perryville—J. A. Perry and C. E. McKerson, Monroe, plans to build a carbon and gasoline extraction plant here.

La., Shrewsburg—Armour & Co. plans to build a acid phosphate and fertilizer plant to replace the one which was destroyed by fire. Estimated loss, $200,000. W. E. Turner, Div. Mgr.

Me., Springvale—The Goodall Worsted Co., Sanford, has awarded the contract for the construction of a 5 story, 24 x 280 ft. mill and storehouse. Esimated cost, $700,000.

Mass., Clinton—The Bigelow-Hartford Carpet Co., Thompsonville, Conn., has awarded the contract for the construction of a 1 story, 100 x 275 ft. dyehouse and 4 story, 100 x 114 ft. headhouse. Estimated cost, $250,000. Noted May 4.

Minn., Mankato—The Mankato Co-operative Dairy Assn. has awarded the contract for the construction of a 2 story, 50 x 122 ft. creamery. Estimated cost, $37,419. A. L. Veigel, Mgr. Noted April 27.

N. H., Laconia—Lockwood, Greene & Co., 60 Federal St., Boston, is receiving bids for the construction of a 3 story, 65 x 100 ft. hosiery dyehouse for the Pitman Mfg. Co. Estimated cost, $60,000. Noted April 27.

N. Y., Mt. Vernon—The General Optical Co. has awarded the contract for the construction of a 1 story addition to its plant on Washington St. Estimated cost, $20,000.

N. Y., Phelps—The Phelps Fruit Growers Assn. plans to build a 1 story, 50 x 100 ft. fruit packing plant on Ontario St. Estimated cost between $5,000 and $10,000. Architect not announced.

N. C., Charlotte—The Textile Mill Supply Co., 51 South College St., is having plans prepared for the construction of a 3 story, 140 x 150 ft. mill supply building and warehouse. Estimated cost, $60,000. Lockwood, Greene & Co., Charlotte, Archts.

O., Cleveland—C. J. Pfeil Co., 1976 West 3rd St., has awarded the contract for the construction of a 2 story, 33 x 50 ft. addition to its woodworking factory on West 3rd St. Estimated cost, $40,000.

Pa., Erie—The Erie Metal Furniture Co. has awarded the contract for the construction of a 1 story, 120 x 200 ft. furniture factory. Estimated cost, $65,000. Noted May 4.

Pa., Phila.—The Roosevelt Worsted Co., 20th and Naudain Sts., has awarded the contract for the construction of a 1 and 2 story knitting mill on 20th and Naudain Sts. Estimated cost, $95,000.

Pa., Pittsburgh—The Newspaper Printing Co., Gazette Sq., will soon award the contract for the construction of a 3 story, 81 x 84 x 107 ft. newspaper plant on Gazette Sq. C. B. Lee, Chamber of Commerce Bldg., Archt.

R. I., Shannock—Lockwood, Greene & Co., Archts., and Engrs., 60 Federal St., Boston, are receiving bids for the construction of additions to textile plant, including 1 story, 45 x 100 ft. weave shed, 1 story, 50 x 105 ft. finishing plant and a 1 story, 17 x 45 ft. boiler house, for the Columbia Narrow Fabric Co. Estimated cost, $60,000.

Tenn., Nashville—The Union Ice Cream Co., Broad St., has awarded the contract for the construction of a 3 story ice cream plant on 12th and Broad Sts. Estimated cost, $200,000. Noted March 30.

Wis., Manitowoc—A. Fischl Dairy Co., 1421 Marshall St., has awarded the contract for the construction of a 2 story, 28 x 110 ft. dairy and ice cream factory. Estimated cost, $50,000.

Wis., Marshfield—Blum Bros. Box Co., 135 West 9th St., has awarded the contract for the construction of a 1 and 2 story, 96 x 120 ft. box factory on Main St. Estimated cost, $100,000.

Wis., Milwaukee—R. Gumz & Co., Muskego Ave., has awarded the contract for the construction of a 3 story, 45 x 52 ft. addition to its packing plant on Muskego Ave. Estimated cost, $25,000.

Wyo., Laramie—J. W. Dillon and J. H. Rousch plan to build a factory here for the manufacture of glass specialties, auto lenses, bevel and plate glass, etc. Estimated cost, $180,000.

Ont., Kingston—The Ontario Provincial Government, Dept. of Agriculture, Toronto, will soon receive bids for the construction of a 2 story ice and cheese making plant, here. Estimated cost, $90,000.

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WHO'S WHO

Mr. Frederick William McIntyre

MR. F. W. McINTYRE, sales manager, of Reed-Prentice Company, Becker Milling Machine Company, Whitcomb-Blaisdell Machine Tool Company, was born in Boston, on June 6th, 1887. He was educated in the grammar and high schools of Boston and began his business career with the Niles-Bement-Pond Company. He was with them in Boston and Chicago for sixteen years.

In 1919 he went with the Becker Milling Machine Company as sales manager and on January 21st, 1921 was made sales manager of the inter-related companies.

Mr. McIntyre is a member of the Boston City Club, the A. S. M. E., Associated Industries of Massachusetts, National Machine Tool Builders, National Metal Trades Association. He is a Knight Templar and a member of the Mystic Shrine.

It is hard to tell which he likes best, boating or fishing, but he talks most about those two young boys of his.

American Machinist

Volume 56 NEW YORK, MAY 25, 1922 Number 21

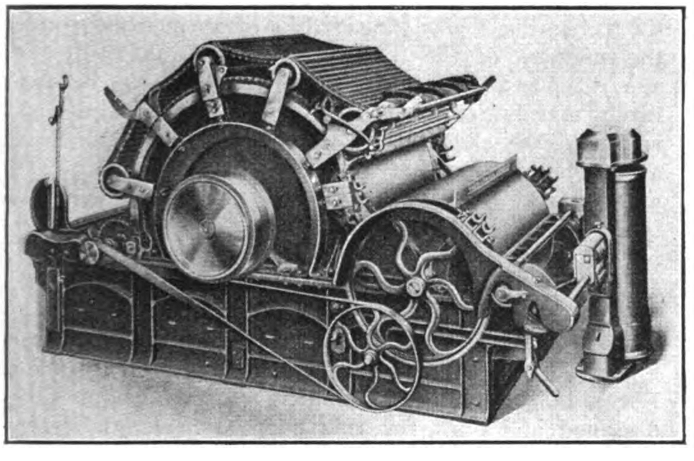
Modern Shop Practice in the Building of Revolving Flat Cards

Details of Special Machines Developed for the Work—Production Cost Per Unit Lowered by Efficient Shop Arrangement, Careful Machine Designing and Standardization

BY F. E. BANFIELD, JR.

Superintendent, Saco-Lowell Shops, Newton Upper Falls, Mass.

BEFORE taking up the details of manufacture of the modern revolving flat card, it may be of interest to trace briefly the development of this machine in order that one may better appreciate the extent to which the art of its manufacture has been developed.



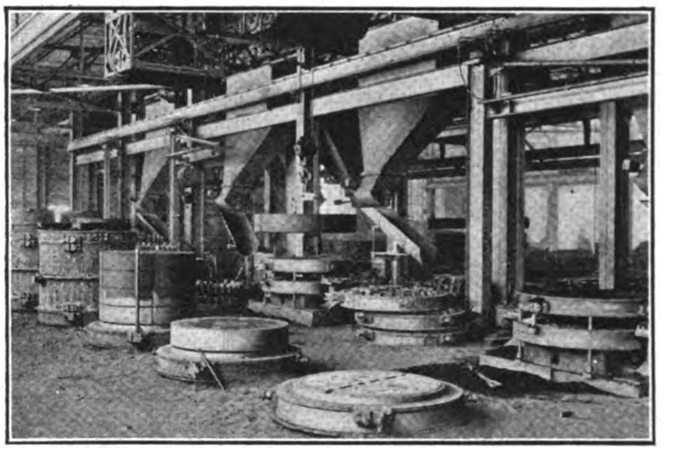


FIG. 1. MODERN REVOLVING FLAT CARD. FIG. 2. CYLINDER MOLDING FLOOR

The primitive method of carding or cleaning cotton fibers was by means of hand cards, which consisted of brushes made of short pieces of wire instead of bristles, the wires being fastened into a sheet of leather at a certain angle, and the leather fastened into a flat piece of wood about 12 in. long by 5 in. wide and provided with a handle. The cotton was spread upon the surface of one of these cards and then combed with another until all the fibers were straight, after which it was stripped off in the form of a roll.

The first attempt to card by the rotary motion of a cylinder was covered by the English patent taken out by Lewis Paul, in 1748, but it was not until 1790, when Samuel Slater, an Englishman who had settled in Pawtucket, R. I., built the first cards to be operated in this country, that carding or cleaning cotton fibers by machine was introduced here.

In 1857 Evan Leigh produced a card embodying all previous developments and having the additional advantage of being equipped with a mechanical device to automatically strip the tops or flats. This type, known as the revolving flat card, was destined to come into almost universal use and is today the standard of the world for carding cotton fibers. Although many modifications and improvements in the construction of this machine have since been made, its fundamental features remain the same.

In Fig. 1 is shown a revolving flat card as it is built today. While there are several different makes of these machines, varying somewhat in details of design, the essential features and characteristics are the same in all.

It was not until the year 1884-1885 that American manufacturers came to realize that the efficiency of this type of card was at least 100 per cent higher than the best of the wooden-top flat cards. As soon as this advantage was made apparent to mill owners the demand for these cards became large, and during the next decade English cards of this type were brought into this country by the shipload. It therefore became necessary for the American machine manufacturer to adopt this new design for his product in place of the old-style machine, in order to compete successfully with the English builders. He was not prepared to manufacture this radically different and highly developed machine. Many of its component parts were so designed that they were not readily adapted to machining on standard commercial types of tools. A start was made by purchasing from England such machines as were available, but it soon became apparent that it

Abstract of paper presented at the spring meeting, Atlanta, Ga., May 8 to 11, 1922, of American Society of Mechanical Engineers.

was up to the American manufacturer to devise and build special-purpose tools and equipment if he hoped to succeed against the English competitor.

It is the purpose of this article to show some of the results of the efforts in this direction by describing some of the more important machines which have been developed for this work. In designing these machines the one object which has been constantly borne in mind has been that they must not only do the work cheaper, but it must be of better quality.

One of the first requisites for economic machine shop production on a quantity basis is carefully molded uniform castings; otherwise satisfactory work cannot be obtained from the jigs and fixtures employed in holding the castings for the subsequent machining operations. For the average card casting with its more or less deep draws and flanges, the stripping-plate type of molding machine has been found best suited. An iron pattern once properly fitted to a stripping plate is good for almost a countless number of castings, and thus made their accuracy in no way depends upon the skill of the molder. In fact, an ordinary laborer can in a few days be taught to make as good castings from a stripping-plate pattern as a skilled molder who has served his time in a foundry.

Developments in molding machines in recent years have made it even possible to adapt the cylinder and doffer patterns to stripping-plate machines and in Fig. 2 we have a view of the cylinder floor showing some of these machines, and illustrating the method by which the molds are built up. This equipment consists of four jolt stripping-plate machines, the drag, the cope, the core and cheek, the first two being seen at the center and the right of the photograph. The molds are shown from the right to left in their successive stages of completion. To provide for the flanges on the inside surface of the cylinder, the core is built up in four sections, one of which is seen suspended from the overhead crane by which it is handled. Each section is built upon a cast-steel arbor which serves as a means for handling and also provides a support for the upper cores. After the cores are in place the cheek is lowered into position and the mold is then closed with the cope and ready for pouring. This is done through a central sprue passing down through the cores and thence through radial gates in the drag to the cylinder wall.

The Stripping-Plate Machine

A view of the card-side floor showing the pattern mounted on a stripping-plate machine at the right is seen in Fig. 3. The drags are made from this machine while the copes are rammed up on the plate at the left. In the foreground may be seen two drags ready for the cores to be set. Over 70,000 molds have been made from this pattern and it is still in serviceable condition.

After pouring, the molds are shaken out over gratings in the floor, through which the sand falls into hoppers located in the basement. Serving these hoppers is the sand-mixing machine or car, shown in Fig. 4. A hopper is located on the right from which a slow-moving feeder delivers the sand to the hopper of a bucket elevator mounted on the car. This elevates the sand to the mixing machine where it is riddled, tempered and mixed and then dropped on to a belt conveyor which delivers it to the bucket elevator at the left ready for the hopper over the molding floor above. This sand car is operated on a track, running the length of the foundry and so located that the car serves all of the hoppers in the bay in which it operates. This equipment does away with the laborious work of shoveling the sand and it also mixes and prepares it much more thoroughly than is possible by hand, thereby producing not only better but cheaper castings.

For transportation of materials, an electrically operated monorail system has been installed. Not only are the cars electrically driven but the switches are also operated in this manner, being controlled by a button in the operator's cab. Special cars are also arranged with ladles for carrying the molten iron from the cupola to the molding floors, and arranged so that the tilting of the ladle for pouring is done by the operator of the car. This system has aided materially in reducing the cost of transportation, as well as increasing the capacity of the foundry by speeding up the work.

Machining the Castings

Upon the solid construction, the true running and the perfect balance of the card cylinder, depends to a large degree the successful operation of the card. Its surface is covered with card clothing, which in turn is set to run but a few thousandths of an inch away from the surfaces of the lickerin, the flats and the doffer, and it is essential that this small clearance be accurately maintained, as otherwise serious damage might result to the clothing. This cylinder has a diameter of 50 in., a length of 40 or 45 in. according to the width of the card, and runs at a normal speed of 165 turns per minute. It is the largest of the parts entering into the assembly of the card and its machining operations are such as require the use of several of the special single-purpose tools heretofore mentioned.

The first operation on the cylinder consists of squaring up and boring out the ends to receive the spiders. For a long time this was done on boring out lathes designed and built for this purpose in England, several of which were purchased and brought to this country.

Then in order to obtain an increased production, and at the same time eliminate the possibility of inaccuracy, it was decided that a milling machine was the type best suited to produce these results. Accordingly the special machine shown in Fig. 5 was designed and built for this work. The cylinder is held on an expanding arbor or chuck, one end of which carries the feed gear corresponding to the rack of the ordinary milling-machine table. The cutters are mounted on the inner ends of two spindles, one on each side of the machine, these spindles, in turn, being driven by spur gears from a motor-driven cross-shaft at the rear. The spindles are mounted in quills so arranged that they may be fed into the ends of the cylinder to the desired depth after it has been rolled into place. A sliding-drive pinion is then moved into mesh with the feed gear on the chuck, this pinion being driven from the cross-shaft shown on the side of the machine. A tight and loose pulley on this shaft receives a belt from a pulley on the motor shaft, the feed being started and stopped by the shifting of this belt. The arbor on which the cylinder is mounted is held in position in the horizontal U-shaped bearings of the machine by means of the steel wedges shown. The photograph shows the cylinder ready to be rolled into position. The head carrying the cutter spindles is adjustable and when once

set for a certain diameter of cutter, work of uniform dimensions is produced and is not dependent on the care of the operator, who merely loads and unloads the machine. This machine is capable of finishing one

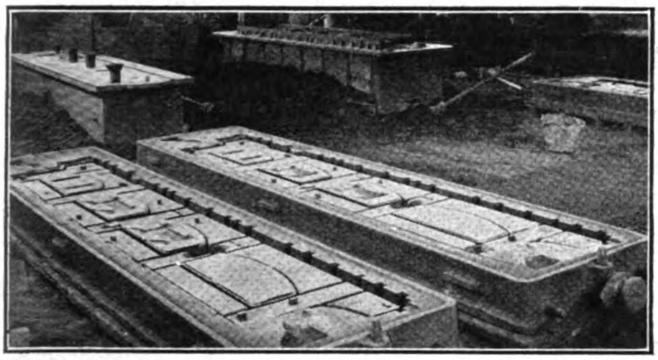


FIG. 3. CARD SLIDE MOLDING MACHINES.

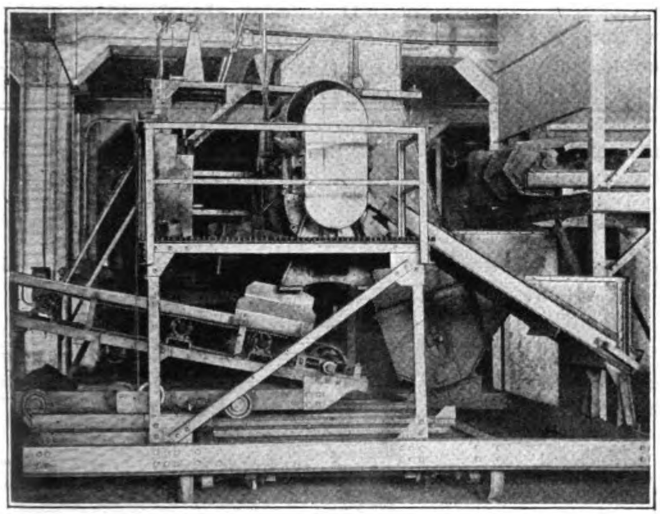


FIG. 4. SAND MIXING MACHINE

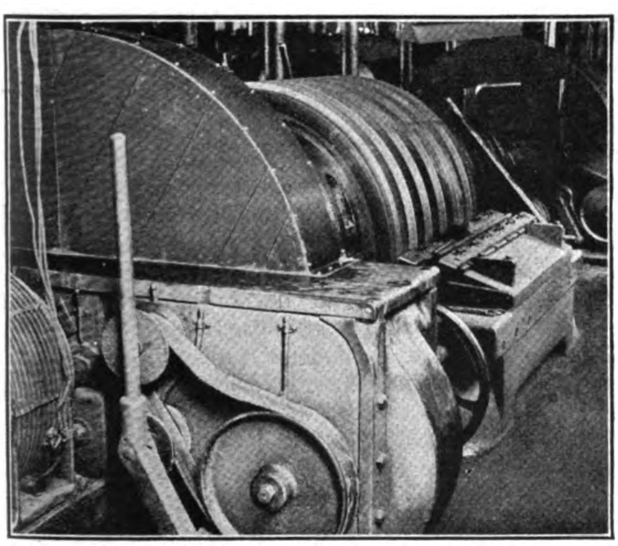


FIG. 6. CYLINDER ROUGHING LATHE.

cylinder per hour, one-third the time required on the previous lathes.

When bored or milled out the cylinder is taken to the roughing lathe (Fig. 6) where it is held by the bored ends and a roughing cut is taken across its outer surface. To convey an idea of the size of this machine, it may be of interest to state that the head and tail-stock spindles are both 30 in. in diameter, the former carrying a driving gear 6 ft. in diameter. The spindles are of cast iron and run in cast-iron bearings, which have shown no appreciable wear during ten years of

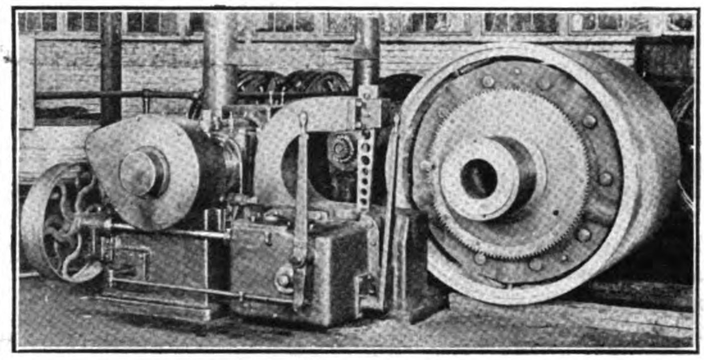


FIG. 5. CYLINDER-END MILLING MACHINE

continuous service. The toolblock carries six tools spaced at equal intervals so that each tool travels but one-sixth of the length of the cylinder, the entire surface being finished by this movement.

A spider is then driven into each end of the cylinder where it is securely bolted and doweled in place. The holes are then line-reamed to receive the shaft, which is pressed into place in a heavy horizontal power press, 0.005 in. being allowed for the forced fit. As a further precaution, a $\frac{5}{8}$-in. dowel pin is driven through the hub of the spider and shaft at the driving end. This method of construction obviates any possibility of the shaft becoming loose from long-continued operation and insures a true-running cylinder.

It is then mounted on its own bearings in a special finishing lathe where a continuous chip is taken from one end to the other with a single tool, after which it is ready to be drilled for the wooden plugs which are driven into its surface and to which the clothing is

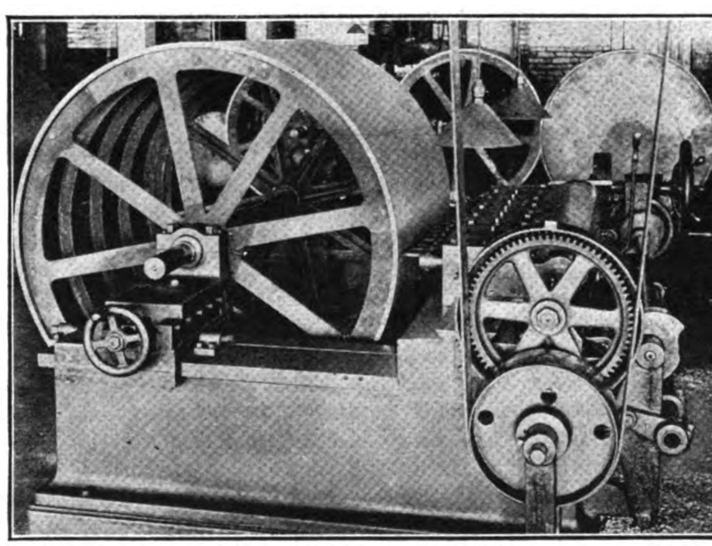


FIG. 7. CYLINDER DRILLING MACHINE

tacked. This drilling operation is performed in the horizontal gang-drilling machine shown in Fig. 7. The drills used here are of the flat type and so shaped as to drill and ream a tapered hole suitable for receiving the wooden plug.

After plugging, the cylinder is carefully ground on a special cylinder grinder. Operations on the spider,

consisting of boring and reaming the hub, of turning the outside circumference to size and of facing one side of the rim, are done on a boring mill so equipped that all of these operations may be performed at one setting of the work.

The shafts used in the cylinders and doffers are of cast iron and each end is finished to three different diameters, one to fit the spider, one the bearing, and the third, or outer one, the pulley. For rough-turning these shafts the special machine shown in Fig. 8 was developed to turn both ends of the shaft at the same time. As will be seen, the central head carries a hollow spindle driven by a gear on the main driving shaft at the rear of the machine. On each end of this hollow spindle is mounted a special concentric chuck for centering and gripping the casting to be turned. The tailstock spindles, one at each end of the machine, are arranged in horizontal turrets or drums which may be rotated in their respective heads and whose axes are located below that of the driving spindle. These turrets are also fitted with a rotating center drill, the driving gears of which are thrown into mesh as it is moved up into line with the axis of the shaft. The third position of the left-hand turret carries a stop which locates the work in the machine, while the corresponding position of the right-hand one is provided with an opening through which the work is passed into and out of the machine. Each carriage is provided with a front and back toolblock, the former carrying two turning tools, while the latter carries a single inverted one. Thus, three tools are in operation at each end of the shaft, one for each of the three diameters.

The shaft then goes to a lathe equipped with two carriages, each of which is fitted with a toolblock arranged with tools for squaring the shoulders to length. It is then ready for the grinder where both ends are carefully ground to size. After cutting the keyway for the driving pulley with a vertical end mill, the hole for the oil screw is drilled and tapped in the end and the shaft is completed, ready to be pressed into the cylinder.

Finishing the Doffer

The operations of finishing the doffer follow closely those of the cylinder, the rough-turning being done on the machine shown in Fig. 9, which greatly resembles the cylinder roughing lathe (Fig. 6). After the spider and shaft are in place, the doffer is drilled, ground, and balanced in a manner similar to the cylinder.

The sides and arches of the framework of the cards are finished by special machines, since the successful manufacture of these parts requires close adherence to accuracy in order to insure interchangeability and to reduce to a minimum the fitting required in the erecting room. In order to secure a straight and even surface on which to erect the card and attain proper alignment of the bearings, the top surfaces of the sides are further finished on a special planer type of grinder carrying a vertically mounted motor-driven ring wheel.

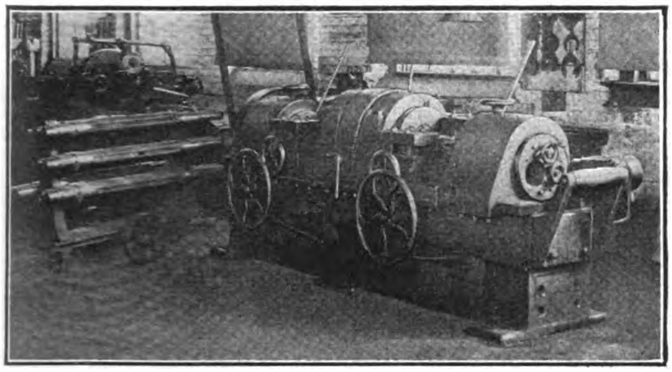
The arch which is that portion of the frame carrying the stands that support the flats and their driving and adjusting mechanism as well as the sheet-iron casing below them, is by the nature of its design, the most awkward as well as one of the most important parts of the card to machine. The proper settings of the different parts require the accurate location of the various spottings on which the stands are mounted. The first operation after squaring off the bottom of the feet is the milling of the outer rim, this being done on the machine shown in Fig. 10. The rotating drum carries a pair of these arches, one right and one left hand. As this drum rotates slowly the circumference of the rim of the arch is carried past the cutter, plainly seen in the photograph, while below this cutter, but hidden from view, are two face mills so located as to mill the inner and outer sides of the rim. Means are also provided for automatically changing the space between these two cutters to allow for the thicker portion of the rim on one side of the arch.

Final Operations on the Arch

The final operations on the arch are accomplished at one setting on the machine shown in Fig. 11. The casting is clamped to the table in a horizontal position on its back and the pair of cutters mounted on the horizontal slide at the left side of the machine serve to mill the spottings to which the arch stands are bolted, while the pair of cutters carried on the vertical head in the center of the picture finish the spottings on both sides of the flange. In addition to these milling operations, the holes for the capscrews securing the stands in place are drilled and tapped. The table of the machine is revolved by hand to its successive positions under the horizontal cutters, while the vertical milling, drilling and tapping heads are free to swing about the central axis to any desired position. The locations of the various spottings and holes are all determined by tapered slots in the rim of the table into which plungers, mounted on their respective heads, are thrust to locate the spotting or hole to be finished.

Against the outer rim of the arch, the flexible bend, over which the flats travel, is held by its adjusting blocks. It is essential that this bend be close to the milled surface of the arch and its sides must therefore be true and even. The finishing of these sides is accomplished, as in the case of the rim of the arch, by feeding the bend between two properly spaced face mills and removing the scale from both sides of the casting at the same time. This operation is shown in Fig. 12. It will be noted that this machine is of a type similar to some of the continuous milling machines which have been recently developed, where the loading and unloading is carried on while the machine is in operation. A rough casting may be seen entering the cutters, while in the rear the finished one is just coming into sight. The cutters are hidden from view in the cut, but are mounted on the ends of the spindles, one on each side of the machine. Large-diameter pulleys for driving the cutters are mounted directly on the outer ends of these spindles. This method of driving a milling cutter directly by means of a belt has been found very efficient, in as much as it eliminates vibration and tendency to chatter caused by a gear drive, the belt producing a certain cushioning effect. Cutters thus driven require less frequent grindings and may be operated at a higher speed than those driven through a train of gears.

Power for driving the card is applied to the main cylinder shaft where a pair of 20-in. tight- and loose-webbed pulleys receive the belt. On the other end of the shaft an 18-in. pulley serves to drive the lickerin and flats. These pulleys require a considerable amount of machine work in as much as each is made with one or more grooves on one side for driving a round belt in addition to the crowned face. The outer



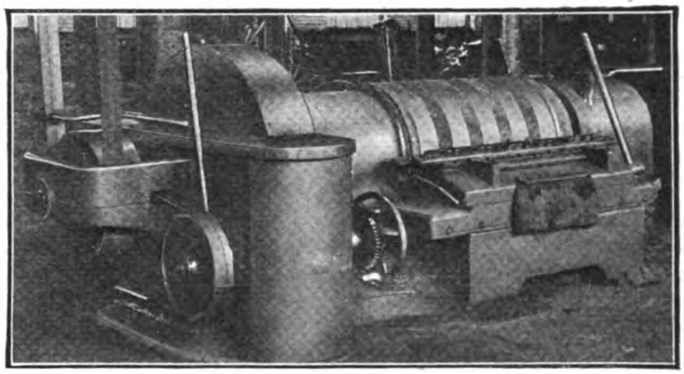


FIG. 8. SHAFT ROUGHING LATHE. FIG. 9. DOFFER ROUGHING LATHE

sides of the webs are also turned. A special lathe, Fig. 13, was developed for doing this work by forming tools which carry cutters the full width of the surfaces to be finished. Special attention is called to the massive design of this machine, the headstock spindle being 16 in. in diameter. The heavy heads absorb

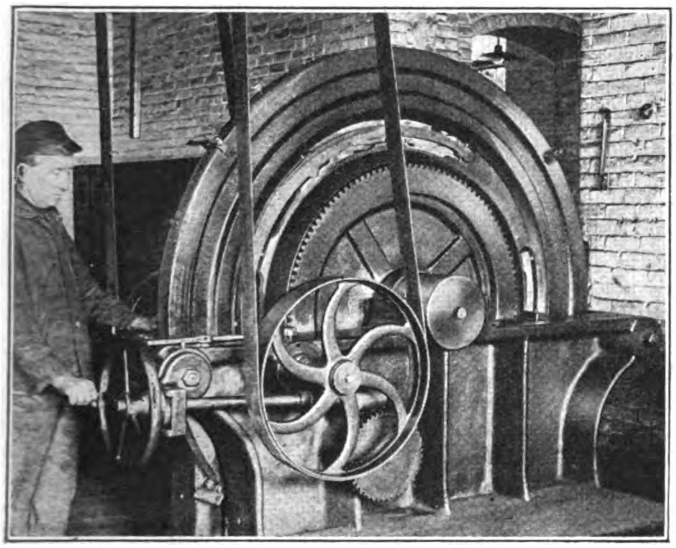


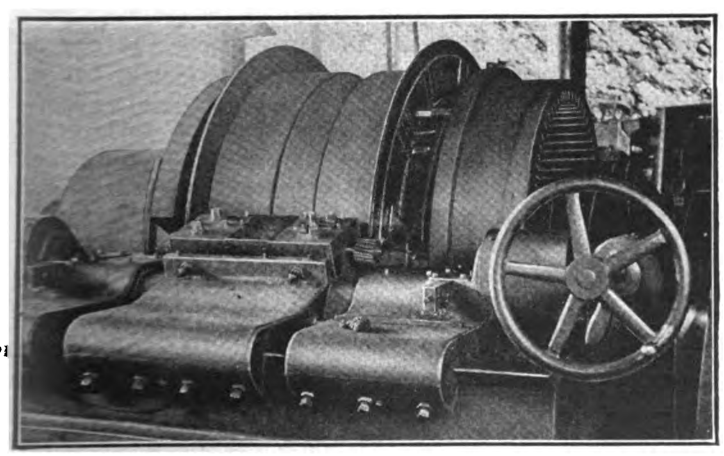
FIG. 12. FLEXIBLE BEND MILLING MACHINE

all vibration even under the heaviest cuts. A special toolblock is arranged for each operation, two of which are shown at the base of the machine; the one at the left being used for forming the web and rim, while that on the right blocks out the grooves and half of the crown, the other half being finished in a second operation by turning the pulley around. A spring chuck clamps the pulley securely in place while turning. This machine also carries a boring bar by which the hole is bored and reamed while the turning operation is going on. The average time for finishing the pulley shown at the left of the machine is 11 minutes.

The boring out of the ends of the lickerin shell also proved to be an operation which could not be readily or economically performed on a commercial type of tool and many of the milling operations on the various smaller parts of the card are such as to require the use of gang or form mills. This is also true of many of the milling operations on other textile machines. For this class of work a semi-automatic milling machine is used.

Coming now to the erecting room, the cards are set up here in rows of twenty-five each as shown in Fig. 14. They are completely assembled with the exception of the clothing and the flats and are then run off and carefully inspected before boxing. Dowel pins are provided wherever necessary so that the work of assembling at the mill is reduced to a minimum.

From the foregoing descriptions and machines which have been illustrated, there are several points to which attention should be called. First, the all-important problem is to get the actual labor cost per piece as low as possible, consistent with the high standard of quality required. This problem is somewhat different from that of most production shops where the low cost of production is arrived at by getting as large a production per machine per day as possible. Many of these special machines are capable of turning out two, three and even four times the amount of work required and are therefore often stopped from one-half to three-quarters of the time. It has therefore been found advantageous to arrange the machines in groups so that one man by operating the group will produce the amount of work required from his machines.



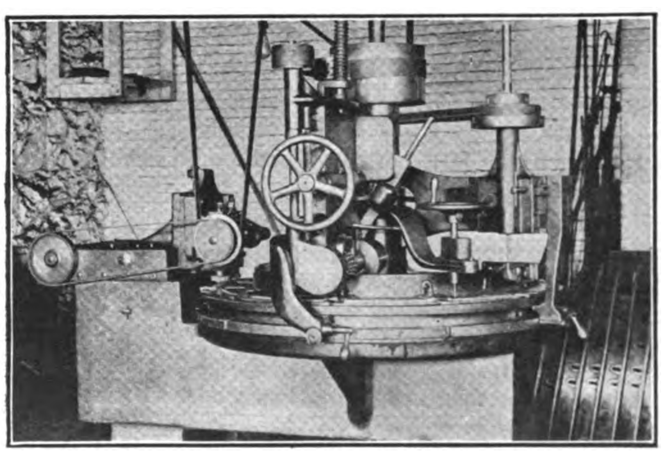


FIG. 10. ARCH MILLING. FIG. 11. ARCH MILLING, DRILLING AND TAPPING

Second, in designing the special machines it will be noted that extremely liberal dimensions have been allowed, and that the lathe and milling-machine spindles have been made to approximate as nearly as practical the diameter of the work to be turned, or the cutter carried by the spindle. In many instances these spindles are made of cast iron, running in bearings of the same material, the surfaces of which when glazed over are almost impervious to wear. The large masses of metal in these spindles, bearings and other parts have been provided so as to absorb all vibration and prevent any tendency to chatter even under heavy cuts and feeds.

Third, each machine is designed to do one or more operations on one special part and is suitable for no other purpose. Equipment of this kind is possible only where the product has been thoroughly standardized and is not subject to major changes in design.

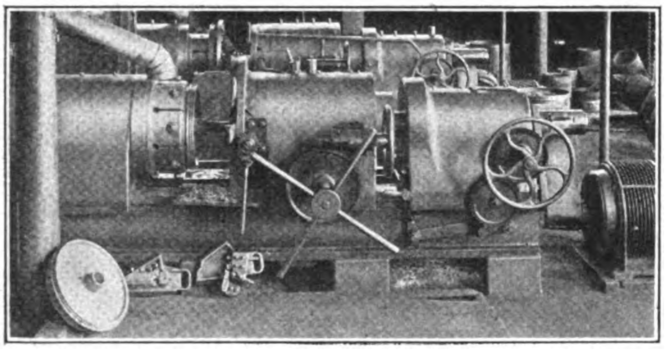


FIG. 13. PULLEY LATHE

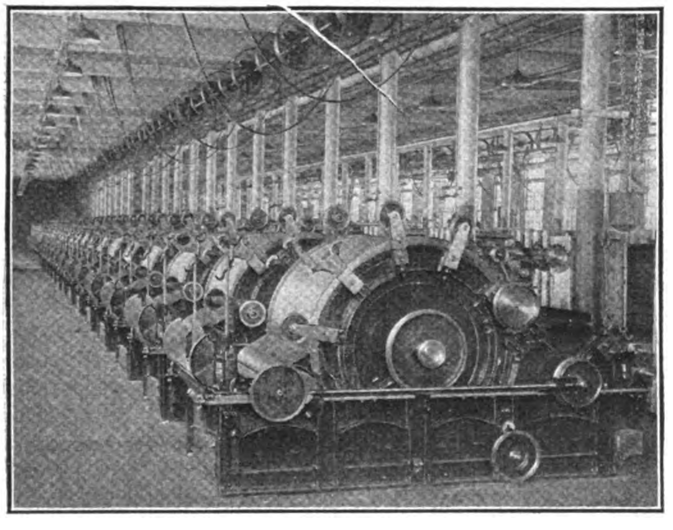


FIG. 14. ERECTING FLOOR

Rewards for Suggestions—Discussion

By F. P. Terry
Belfast, Ireland

The contribution under the above heading by C. J. Morrison, on page 448, Vol. 55, of American Machinist, deals with a subject which I think has been somewhat neglected of late, but which at the same time is one of the most important under the present difficulties, and may be termed as making two blades of grass grow instead of one.

As Mr. Morrison suggests, it is a square deal that is necessary first and last. Many schemes have been tried, many have died almost at birth for lack of some little link. In some cases it has been a jealous manager or foreman who has been at fault, in others, the reward has been inadequate to the saving affected. But this would seldom kill a scheme where proper recognition is forthcoming, apart from the monetary element.

Money, Promotion and Increased Salary Popular Rewards

Some twenty years ago I was connected with a firm that had a very popular and successful scheme in operation. The money award was in most cases small, but promotion and increased salary were certain. In one case, a machinist who was milling brush parts for a motor developed a new design that was taken up by the firm. His reward was promotion to the position of foreman of the brush making department, a position practically created for him. Soon he came along with other suggestions and he eventually became head foreman of the electrical department.

A suggestion from a turner of a special chuck to allow for the machining of engine eccentrics at one setting brought as a reward an assistant foremanship in the machine shop, which resulted later in other improvements and the official position of jig and fixture designer. There were also dozens of other cases of men getting increased wages and better machines to operate.

Ten years ago the old manager died and the suggestion scheme lingered for a few months then passed away. The new manager had the idea that he could do all the suggesting himself, or at least take all the credit.

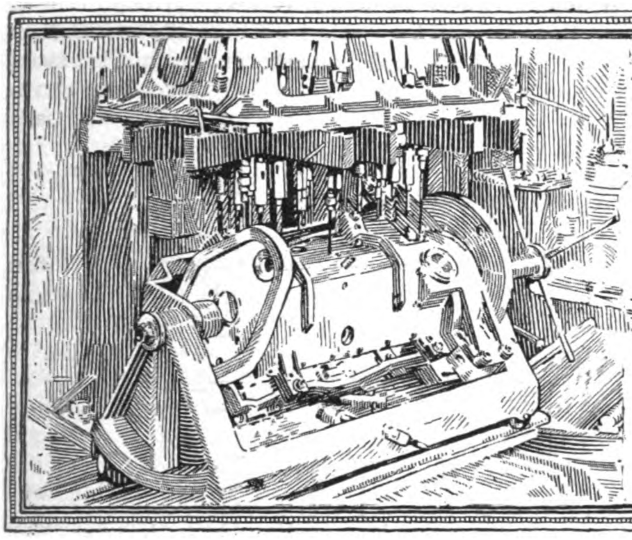
Mr. Morrison proposes a committee of judges. While this may be successful, I think the manager alone should have the necessary powers and be the sole judge. If the manager is not broad enough to carry out this important part of sucessful management, he should be replaced, as also should foremen who use their position to crib and claim the ideas belonging to others.

A Broad-Minded Manager

In the control of the successful scheme mentioned above, the old manager took full charge. Any ideas put before him were carefully considered and when adopted were often considerably improved by his own suggestions, for which he never claimed the slightest credit but gave all honor to the originator. All awards were recorded in the works magazine published quarterly. Anything especially good would be described fully with the inventor's photograph, or sometimes inventors would be invited to describe their inventions themselves. This added additional charm, quite apart from the money element, although these descriptions were paid for at liberal rates.

Human nature is very much the same the world over, and nothing is so annoying as being robbed. Many men would kick up more fuss if robbed of one dollar than they would if they were to lose fifty. It is the robbing of men's ideas that is the great drawback to so many suggestion schemes and that keeps work from being done on up-to-date lines, to the loss of the firm and the world at large.

If we had more broad-minded managers always ready to forget personality when it is to the firm's advantage, as in the case mentioned above, we would have many more successful suggestion schemes and contented workers. The pity is that such managers are so scarce.



Tool Engineering

By
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Methods of Designing Tools for Turret Lathes Continued—Different Ways of Developing the Design—Detailed Layouts for Pulley and Bevel Ring Gear

THERE are several methods of making turret layouts. Some factories show a simple yet complete set-up, with all the tools in place on the turret. Others go a step further and show the turret set-up with tools on one sheet, while on another each operation is shown in detail with the tools in their respective positions. There is still another method in vogue, which shows all the tools on the turret and each operation in detail on the same sheet. In addition to this, all tool numbers and reference numbers to drawings on which tool details appear are given on the sheet, and each operation is specifically noted by means of reference letters on the various surfaces which are to be machined.

In selecting a method, the tool engineer should be governed partly by factory conditions and the procedure in the past. Judgment must be used in the matter and a suitable method selected and standardized in order to obtain uniformity. If tool layouts are blueprinted and made up in book form for factory reference, the sizes of sheets should be uniform and of such shape that they can be easily handled.

In Fig. 379 is shown a turret layout of a plain pulley with all the tools in position on the turret. Figs. 380 and 381 show the various operations in detail. Referring to Fig. 379, the work *A* is a plain pulley which is to be turned, bored and faced on both sides. It is held by the inside of the rim in a set of special chuck jaws *B*, which are so made that the facing tools on the cross-slide can pass by the edge of the flange without interference. The toolholder *D* contains a boring bar, corner tool and turning tool for the outside diameter, all being used for the roughing operation.

The holder *E* is a duplicate of *D*, except that it is used for finishing, and the corner tool is left out because one cut is sufficient to do the work. Holder *F* contains a reamer which is arranged so that it will float and follow the hole generated by the boring tools. Tools *G* and *H* are standard slide tools, which are used for rough- and finish-facing the back of the pulley hub. The cross-slide in this machine has a turret toolpost *K*, in which are held the tools used to face the front of the hub and both sides of the flange.

The starting and completing of the first operation on the pulley is shown in Fig. 380. The cross-slide tool *L* is first used for facing off the end of the hub. After this cut has been started, the turret is brought up until the boring bar pilot enters the bushing and the boring tool commences to cut. Soon after this the turning tool *M* comes into operation. About this time the facing tool *L* has completed the work on the end of the hub; it is therefore withdrawn and the turret toolpost indexed to allow the two facing tools *O* and *P* to be used on the sides of the flange. Meanwhile the boring and turning tools continue to cut, eventually completing their work, at which time the "knock-off" stops the turret slide. Hand feed is then used to round the corner of the hub with the tool *N*.

In Fig. 381 is shown the remainder of the operations in detail. The cross-slide tools continue to face the flange while the finish-boring bar and turning tool *Q* in the holder *E* on the second turret face are brought up and set to work. The knock-off on the cross-slide stops the slide at the proper point and the facing tools remain in the position shown, or they can be run back out of the way if desired.

The hole is reamed with an adjustable reamer *R* in a holder of the floating type. On a cast-iron piece such as that shown, the reamer is usually fed by hand in order to size the hole more rapidly. If a slow machine feed is used, there is always the possibility of enlarging the hole slightly, due to the scraping action on the edges of the blades. The production is faster if the reamer is fed by hand, and the work is more uniform.

The last two operations on the work are rough- and finish-facing the back of the hub. A bar *S* inserted in the slide-tool *G* is operated by hand in a vertical direction. The turret is brought against a stop to obtain the correct longitudinal position, and held in place during the operation.

Many turrets have six sides, but there are also those with five, four and three. The majority of the machines in common use have either six or four sides, although on certain kinds of work the others are often used. Some years ago a certain type of turret lathe was made with an eight-sided turret; but this type was

not used very generally as its field was limited, due to the possibility of interferences of turret tools with others on the cross-slide of the machine. The six-sided turret occasionally causes trouble in this regard, so that the tool engineer must keep his eyes open in order to make sure of the necessary clearances.

A four-sided turret allows more tool clearance and there is little chance of trouble being caused by a lack of room for the tools. Fig. 382 shows a layout for a piece of work A which is to be handled on a machine having a turret with four sides. The piece is held by the inside of the rim in a set of special jaws B in a three-jaw chuck, in which the bushing H is fixed to act as a guide for the boring bars and reamers. The holder C is fastened to the first turret face and has an extension bracket D, in which are carried the turning tools E and F. Fine adjustment is provided by means of the backing-up screws shown.

The tools in the holder are set vertically, although for convenience they are shown in a horizontal plane in the layout. A rough-boring bar G is held in the same holder and used for boring the hole in the hub. The front of the cross-slide has a special toolblock K in which are held the facing and grooving tools L, M and N. These latter are roughing tools used for making the first cut on the flange, facing the end of the hub and roughing out the groove $\frac{1}{32}$ in. under the finished size.

The toolholder O on the second turret face is exactly the same as that used on the first turret face, but it finishes the surfaces roughed off in the previous

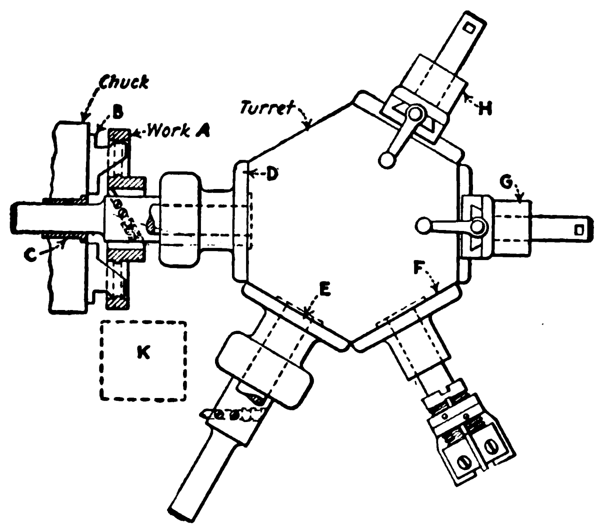


FIG. 379. TURRET LAYOUT FOR PLAIN PULLEY

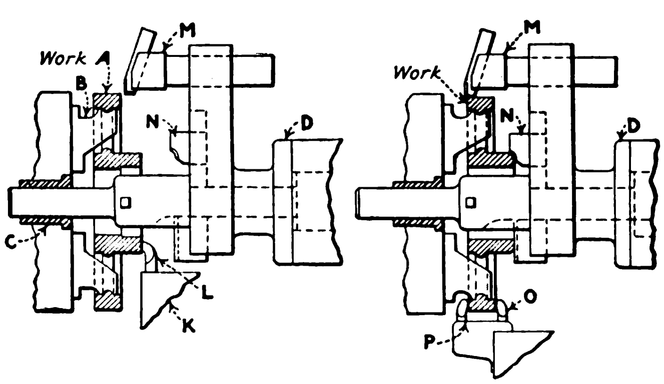


FIG. 380. START AND COMPLETION OF FIRST OPERATION ON PLAIN PULLEY

operation. While this tool is in use, the rear toolblock T on the cross-slide is brought up into position, so that the tools U, V and W perform the finished-facing and grooving operations. The third turret face carries

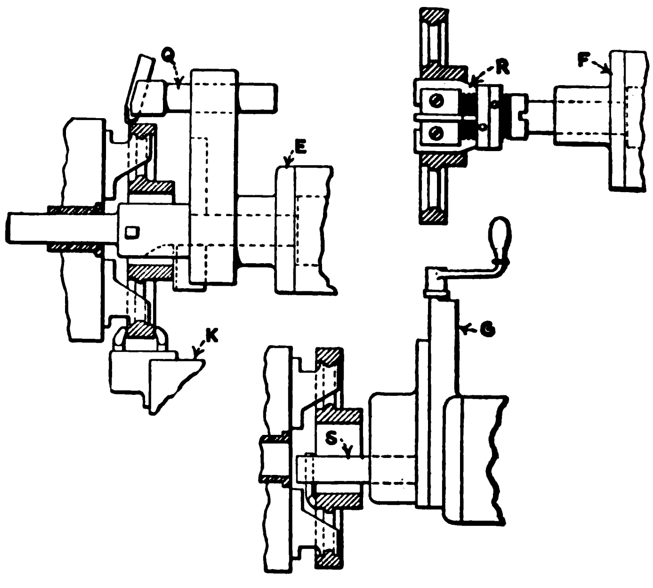


FIG. 381. REMAINDER OF OPERATIONS ON PLAIN PULLEY

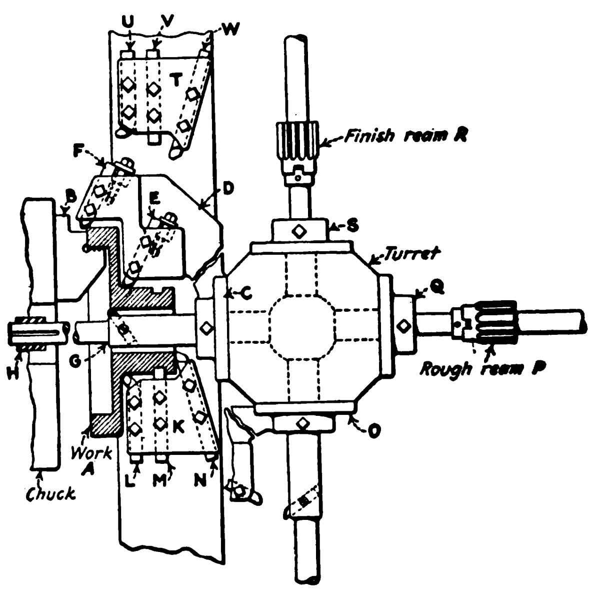


FIG. 382. TURRET LAYOUT FOR MACHINE WITH FOUR-SIDED TURRET

a roughing reamer P which is supported in a floating holder Q. The fourth and last turret face has a holder S, which is also of the floating type and carries the finishing reamer R.

This use of two reamers, one for roughing and the other for finishing, is not common, yet it is used occasionally when very accurate work is required. In this layout of tools the attention of the designer is called to the operation of the turret turning tools and the cross-slide facing tools, as the lengths of the various cuts are so nearly the same that the turning and facing operations are completed at practically the same time with the equipment indicated.

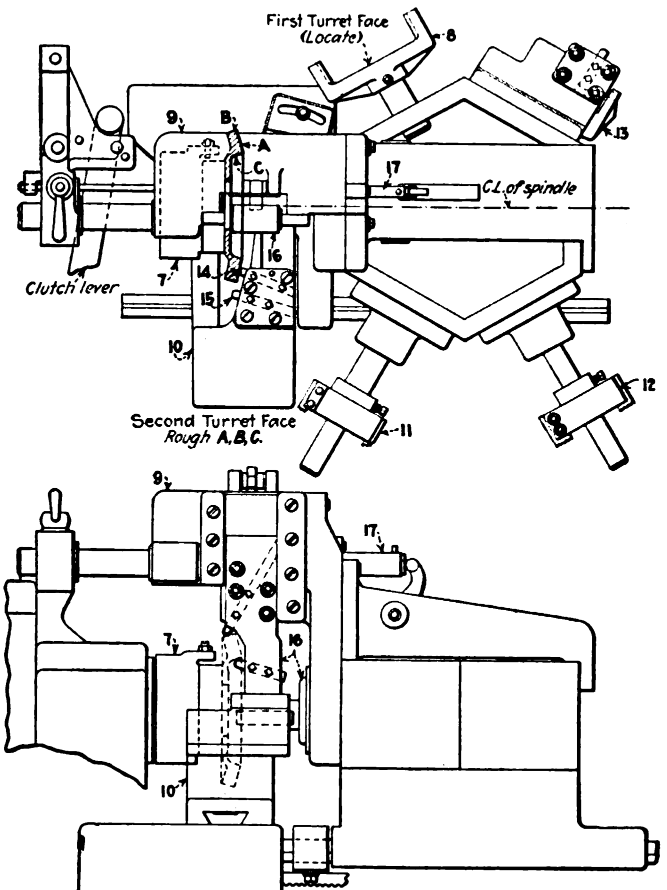
In order to illustrate the application of one of the methods of making turret layouts, we give a complete layout in Figs. 383, 384 and 385 of a special equip-

ment used in machining a bevel ring gear for the rear axle of an automobile. Fig. 383 shows the work *A*, which is a drop forging of alloy steel, held by the outside in a set of special chuck jaws *1*. These jaws are undercut, so as to grip the work firmly and prevent it from being pulled out of the jaws during the cutting. The surfaces which are being machined are lettered, and all tools used are numbered and listed at the bottom of the layout sheet.

A brief description of each operation, together with a reference to the portions of the work on which the cuts are being taken, is given with each layout showing details of the set-up. For example, the first operation consists of rough-boring the hole *G* with a special boring bar *4*, and rough-facing the surface *F* with tool *2* in the turret toolpost of the cross-slide. The remainder of the operations shown on this sheet are clearly specified and all tools used are listed with their drawing numbers at the bottom of the sheet, so that tool drawings can be easily found when wanted. The title of the drawing and other information as to the work and the machine on which the tools are used is given in the lower right-hand corner of each drawing, in the usual manner.

Between the first and second turret lathe settings, the bolt holes are drilled in the face *F* which has just been machined. This provides a means of driving the work during the heavy cutting of the beveled faces. In order to make this layout clear, a description of the holding device is necessary and some mention of the other tools used in Fig. 384. The work is located on a large special arbor *7*, which is fitted to an adapter on the spindle in such a way that it can be trued up when necessary if it does not run perfectly true with the spindle. The arbor is provided with a pin which enters one of the bolt holes and acts as a driver. A taper plug in the center of the arbor acts upon three shoes which expand in the hole and grip the work and center it at the same time.

A locating device *8* is mounted on one of the turret

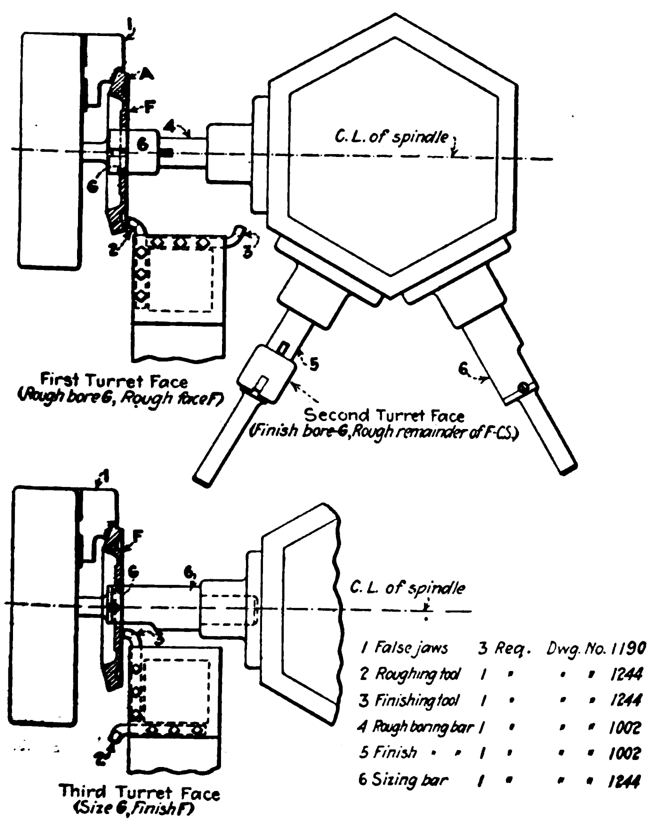


7 Taper arbor	1 Req. Dwg. No. 1137	13 Finishing facing tool	1 Req. Dwg. No. 1035
8 Locater	1 " " " 1137	14 Roughing tool	1 " " " 1194
9 Taper turning attach.	1 " " " 983	15 Finishing tool	1 " " " 1194
10 Taper cross slide	1 " " " 1194	16 Special tool slide and guide for ring gear	1 " " " 1137
11 Radius head	1 " " " 1251	17 Taper bar for ring gear	1 " " " 1137
12 Rough facing head	1 " " " 1244		

FIG. 384. TURRET LAYOUT FOR BEVEL RING GEAR—SECOND SETTING

faces and used when setting up the work on the arbor, in order to hold the piece up against the shoulder and preserve the correct location. In the first operation in this setting, a special taper turning attachment *9* (which was described in detail in a previous article) is used for turning the back angle and boring the inside angular surface of the gear blank shown as *B* and *C*. A special toolblock is mounted on the slide for this work, and because of the excessive overhang a support *16* is provided, in order to give the necessary stability and prevent any vibration.

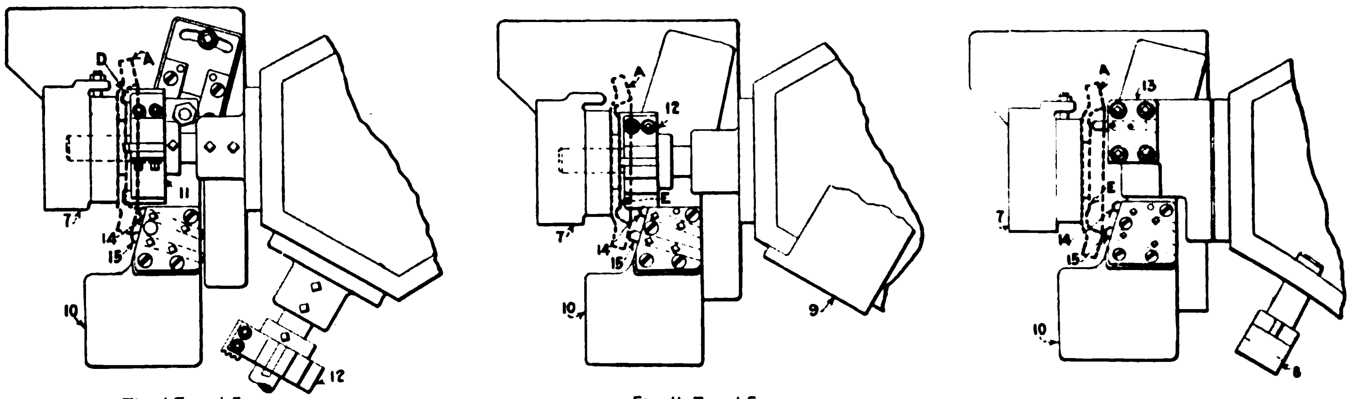
A special taper cross-slide *10* is used for rough- and finish-facing the face angle of the gear *A*, the two tools *14* and *15* being used for the work. These tools are set far enough apart so that the roughing tool has completely finished its work before the finishing tool starts. The tools *11*, *12* and *13* are used for roughing the inside surfaces of the blank. The combination of a special cross-slide with a taper turning attachment on the turret increases the production greatly and gives very accurate work, as all the surfaces are machined by single-point tools controlled by accurately set taper forms.



1 False jaws	3 Req.	Dwg. No. 1190
2 Roughing tool	1 "	" " 1244
3 Finishing tool	1 "	" " 1244
4 Rough boring bar	1 "	" " 1002
5 Finish " "	1 "	" " 1002
6 Sizing bar	1 "	" " 1244

FIG. 383. TURRET LAYOUT FOR BEVEL RING GEAR—FIRST SETTING

The remainder of the operations are shown in detail in Fig. 385. The taper cross-slide continues to work after the turret taper attachment has been withdrawn. The turret is indexed and the radius cutter head *11* which is being cut is tough and "wirey" so that the radius at the cutting point of the tools is nicked to break the chip and make the cutting action easier. The grooves in one tool overlap those in the other, so



Third Turret Face
(Rough remainder of A, face D rough)

Fourth Turret Face
(Finish A, Rough E)

Sixth Turret Face
(Finish remainder of A, Finish face E)

FIG. 385. TURRET LAYOUT FOR BEVEL RING GEAR—DETAILED OPERATIONS OF SECOND SETTING

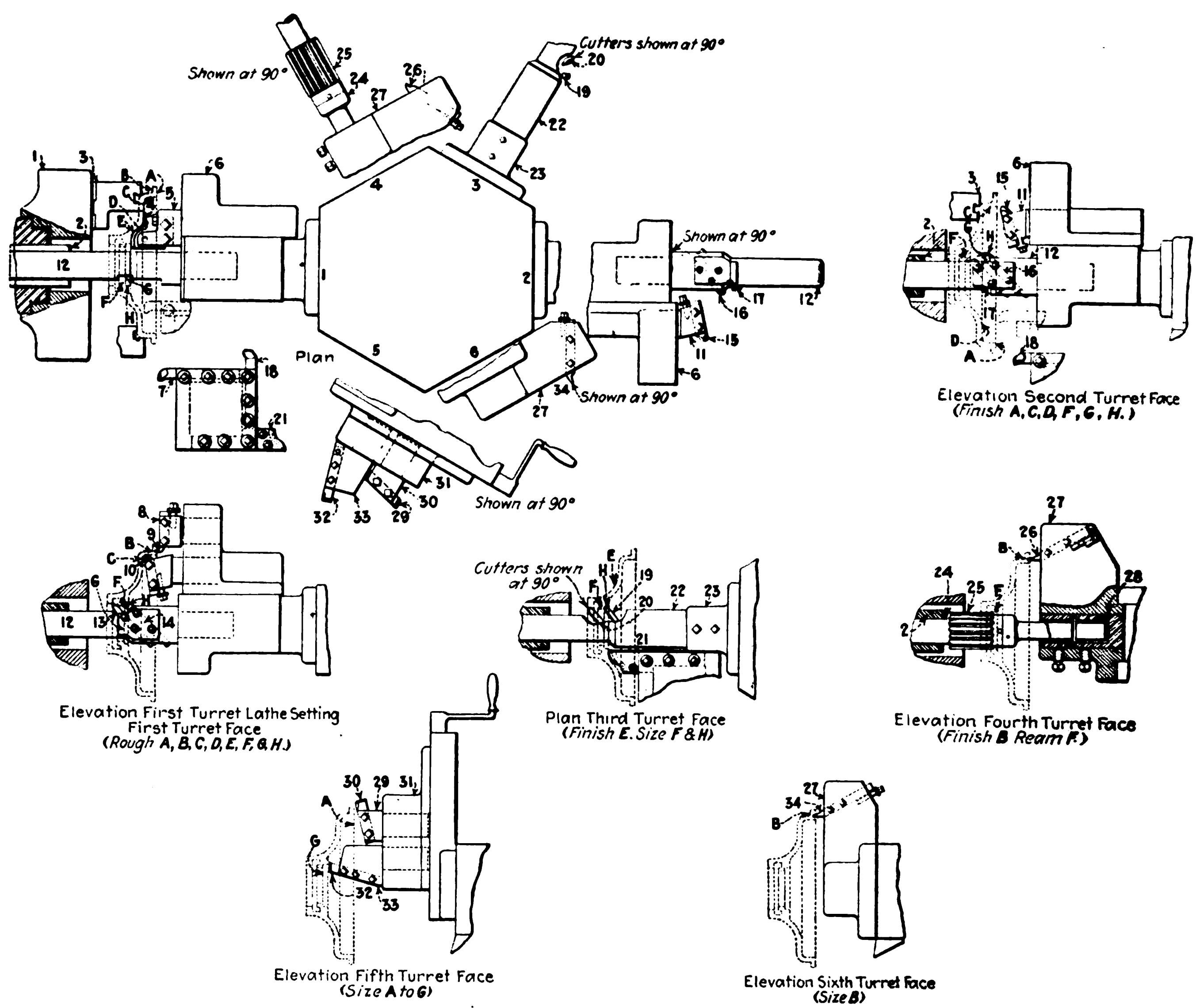


FIG. 386. COMPLETED TOOL LAYOUT FOR ROTOR CASING WITH REFERENCE NUMBERS

is used to remove the stock from the curved portion of the blank *D*. The tools in this cutter head are arranged so that they do not interfere with the continued action of the tapeı cross-slide. The material that the finished surface does not show any grooves.

The rough-facing head *12* is the next tool used for roughing the surface *E*. The toolbits are nicked the same as the radius tools to break the chip, and the

tool positions are such that the cross-slide continues to work on the facing of the angle without interference. The blank has now been completely roughed where necessary and finished on all important surfaces except the portion *E*, which has only been roughed.

To be sure of an absolutely true surface at *E*, the work should be faced with a single-point tool; but as the cross-slide is set at an angle it cannot be used, and as the turret has no crossfeeding movement it is evident that it is not available. In order to overcome the difficulty, a special slide tool *13* is mounted on the turret so that a single-point tool takes the position shown ready for the facing cut on the surface *E*. This tool is brought up to its place just as the angular facing cut is completed by the cross-slide. The feed of the latter is reversed and a block on the cross-slide engages with a slot in the under side of the sliding member on the turret, thus causing the single-point tool to move across the surface to be faced and producing a true and accurate finish.

The entire equipment shown in these layouts is considerably out of the ordinary and it is not by any means cheap; yet all of the tools are so designed that they can be adapted to a number of different pieces of work, so that the cost distributed over the various parts is not excessive. Furthermore, the work produced is of great accuracy, which is an essential item in the manufacture of bevel gears and pinions. The production is very rapid, and there is little time wasted either in setting-up or in machining.

Another Method of Making Layout

When it seems desirable to show a turret layout and details of the various operations on the same drawing, the arrangement must be carefully studied in order to avoid confusion. As these layouts are used in the factory, they should be as clear as possible so that the persons who use them will be able to understand the tooling methods readily. Fig. 386 shows a complete layout for a turret lathe operation on one-half of a rotor casing for a gyroscopic compass. This work required great accuracy and the tool equipment was designed with this point in mind, although a number of standard toolholders were used because the production required is not very high and only a few parts of any one kind are machined at one time.

The work is held by the outside in a set of special chuck jaws *3* in a standard three-jaw universal chuck. The casting is of an aluminum composition and somewhat fragile, so that the position of the jaws in their relation to the work was selected with care in order to avoid distortion. A universal turning and facing head *6* holding a boring bar *12* and various other tools designated by number, is used first on the work for roughing the surfaces *B*, *C*, *E*, *F*, *G* and *H*. The tool *7* in the cross-slide turret toolpost is fed outward and used in roughing off the surfaces *A* and *D*. The second operation is that of finishing *C*, *F*, *G* and *H* with another toolholder on the turret, and a final cut is taken across *A* and *D* with a tool *18* in the cross-slide.

The third operation finishes *E* and sizes *F* and *H* using a special boring bar *22* and a forming tool *21* on the turret toolpost of the cross-slide. In using the latter the cross-slide is located against a longitudinal stop and the tool fed outward by hand until the indicating dial on the crossfeed screw shows that the correct diameter has been obtained. The operators would allow the tool to dwell here for a moment in order to obtain a smooth finish.

The fourth operation is that of reaming the hole *F* with the reamer *25*, which is held in a special floating holder in the body of the toolholder *27*. This toolholder carries a tool *26* used for roughing the groove *B*, which is very important as it fits a bead on the other side of the case. Attention is called to the fact that this tool is held vertically instead of horizontally in order to obtain as high a degree of accuracy as possible. The importance of this arrangement has been mentioned previously.

In the fifth operation a vertical slide toolholder *31* is furnished with two tools *30* and *32*, which are accurately set to preserve the accuracy of the distance from the face *A* to the surface *G*. The sixth operation is the final sizing of the groove *B* with tool *34* in holder *27*. This sizing is the last operation on the work, because it is of such importance that it is desirable to do it alone and thus make sure that no changes in relation can occur due to the possible shifting of the work.

The various examples of layouts given in this article cover a considerable variety of work, and the methods described are all in use in various factories. A decision as to the most suitable method for a given shop should be reached only after a discussion of the merits of each and a knowledge of conditions which affect the situation. Speaking generally, the writers favor the process shown in Figs. 383, 384 and 385, largely because the operations are shown so clearly, and the sheets are so proportioned that they can be photostated and bound up in a loose-leaf letter-size book for convenient reference.

The Foreman's Authority

By A. W. Brown

This is often an undefined thing; not exactly *x*, the unknown quantity, but at least a quantity of which the true value is not understood by those of whom he is in charge. Sometimes, indeed, the foreman himself has no sure comprehension of exactly where he stands and of how readily and how far the management will back him up, should he unwittingly overstep his authority. Nor does he know whether they will endorse his actions, should he exert his authority to the utmost. This matter should be made clear alike to the foreman and to those under him.

Reo Aluminum Alloy Pistons

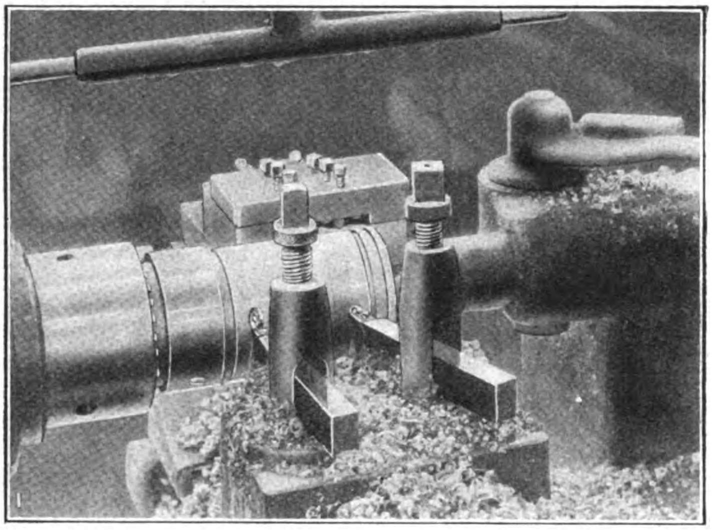
Machining Methods Practically the Same as with Cast-Iron Pistons—Snap and Dial Gages Used for Inspection—Selective Assembly in Cylinders

By FRED H. COLVIN
Editor, American Machinist

THE Reo shop is one that has been successful in using aluminum alloy pistons, handling them in much the same way as cast iron. The first operations are to disk grind the ends, face and bore the open end and center the head, holding the piston from the inside so as to secure a wall of uniform thickness. A semi-automatic machine is used to rough-turn the outside and to rough out the ring grooves at the same time. This operation is shown in Fig. 1, which also shows the kind of chips that come from the alloy. The open end is then rebored, true with the roughed outside, and the inside chamfered.

The finish-turning and grooving is done on a similar machine at a second operation, after which the head is roughed and finished. Re-centering comes next, followed by three grinding operations which include the taper at the upper end.

Cross-boring for the piston pin is done in the chuck



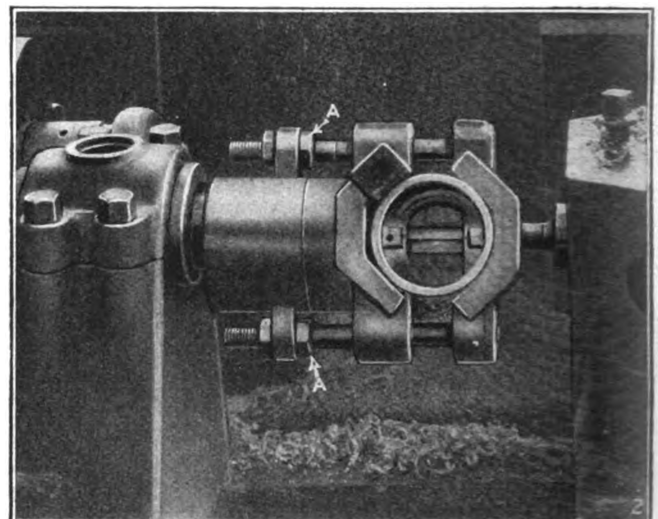
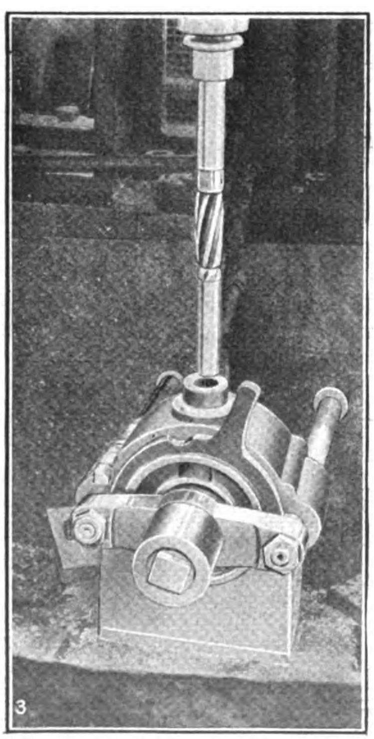


FIG. 1. TURNING AND GROOVING ON SEMI-AUTOMATIC MACHINE. FIG. 2. BORING THE PISTON-PIN HOLE



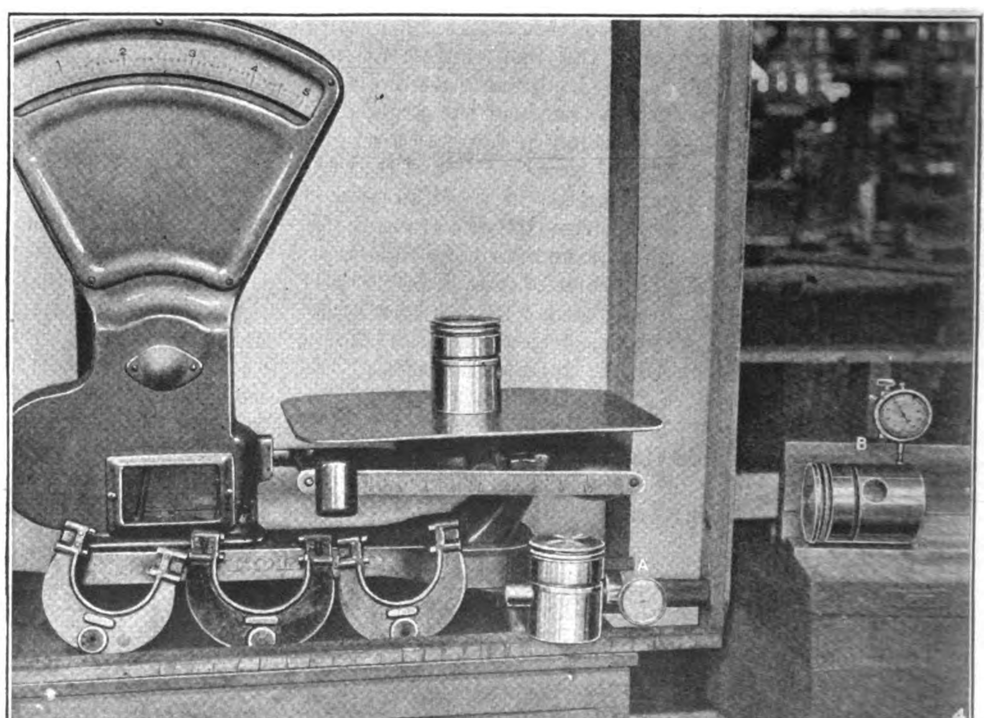


FIG. 3. MACHINE REAMING OF PISTON-PIN HOLE. FIG. 4. SCALES AND INSPECTION GAGES

shown in Fig. 2. The check nuts on the back of the studs at *A* and *A* prevent drawing the outer clamp too tight and distorting the piston. The bosses are faced in the usual manner and the piston washed and carefully burred before inspection. The machine reaming is done in a special fixture, Fig. 3. The crossbar in front slides forward to release the piston.

The ring grooves are carefully inspected and the piston weighed on the scales shown in Fig. 4. The piston is again washed, the pinhole hand reamed to size and then washed a third time. The rings are fitted to the piston in the assembly line and returned to the bench for the rest of the operations.

In Fig. 4 are also shown a number of the inspection gages used on the piston. The snap gages test the diameter and the width and depth of ring grooves. The gage at *A* tests the squareness of the hole with the piston. The dial gage is fastened to the large diameter of the plug and when turned to indicate both above and below the hole, it tells the story of squareness of the hole with the body. Roundness is tested at *B* where the piston is revolved under the gage as it lies on the angle plate shown.

The method of fitting the pistons, or rather of selecting the pistons for any given motor, is shown in Fig. 5.

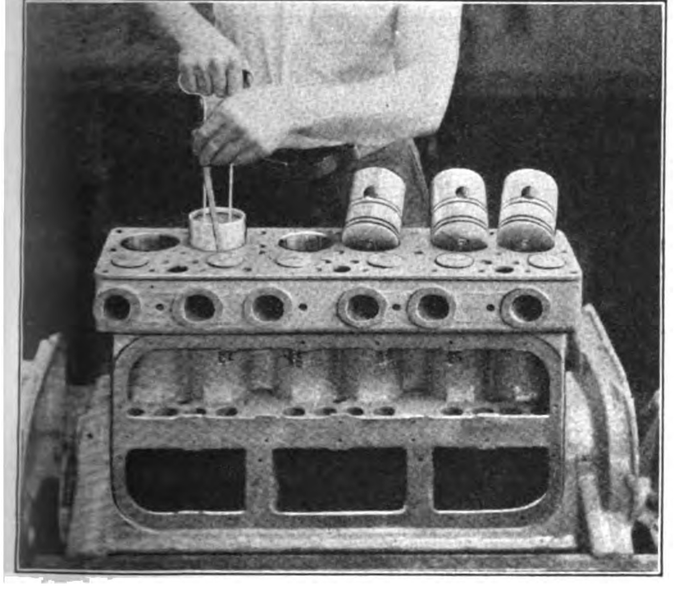


FIG. 5. TESTING PISTON CLEARANCE

A convenient wire handle enables the operator to get the "feel" of the piston in the bore when the feeler of proper thickness for the clearance is in place beside the piston. This view also shows the large exhaust valves; the inlet valves are in the removable head.

Planing Flat Gibs—Discussion

By J. M. Henry

The article under the above title, on page 219 of American Machinist and the criticism thereof on page 408, led the writer to investigate the methods employed for planing similar pieces in our plant.

It seemed that the bending of gibs was not the proper method, as the correction made to overcome the springing tended to set up other strains that would have to be compensated for in some manner. Also, it seemed that considerable care was required to get just the right amount of bend to take care of the "wind."

Some time ago the planer department became dissatisfied with our methods on this class of work, both as to time and finished results. After some experimenting the following method was tried out and has proved so satisfactory that it has been practiced ever since in planing thin cast-iron gibs, both parallel and taper, and on work of similar character.

The castings as they come from the foundry are planed on one edge and then laid on the planer table in their natural position, shimming up where necessary to make them bear solidly. The planed edge is placed against a block or strap with a bunter against the opposite unfinished edge bearing just a little above the center of the piece, the object being to force the finished edge against the solid support without putting in a "wind" or "twist."

Careful clamping is, of course, nine-tenths of the job, but in this case it is comparatively simple. On long pieces, blocks and bunters are used near the ends only and no effort is made to clamp the piece down on the table, as the edge friction may be depended upon to hold it in place.

After clamping, the upper surface is roughed and *finished*. When released the gib naturally takes a "wind," that is commonly supposed to be caused by the scale pulling in on the unfinished side after the strain on the opposite side has been released by the removal of the scale. The piece is then laid with the finished side against the table, *forced* down flat and the remaining wide side *finished* to bring the piece to proper thickness. The result is that in the second operation the strains set up by the first are compensated for and the finished piece is found to be flat, parallel and free from twist or wind. Theoretically this seems reasonable and has been demonstrated to work out in practice.

No one would believe this to be true when it was first suggested, but when the inspector was handed a lot of pieces, half of which were finished by this method and the other half by the old method of roughing all over and then papering up for finishing, he could not tell the difference. In fact he picked out many pieces machined the new way as being the most perfect. The saving of time is obvious and it is a fact that very little scraping is found to be necessary, as all gibs are straight and to standard sizes.

Steel gibs and flat plates are generally finished on the vertical surface grinder, as oftentimes where size is unimportant it is necessary only to skim the surface. Cast-iron gibs or plates not to be held to a definite dimension are also ground. The only reason why the surface grinder and magnetic chuck is not generally used for thin cast-iron gibs lies in the fact that it is almost impossible to make thin flat castings with a surface good enough to supply a minimum allowance for grinding, and still leave enough stock to obtain an accurate thickness. For this reason it is found to be better practice to leave about ⅛ inch for finish, and plane to size in this way. Large cast-iron tables, approximately $1 \times 24 \times 60$ in. have been successfully planed in the manner described, without a trace of wind.

In some cases long steel plates are milled and then finish ground to size following the method of holding at each end in a vise and depending upon side clamping only, bracing from the under side at the ends and center and allowing the piece to take its natural position.

There is not as much wind produced in milling as there is in planing, but when it appears the piece is forced down on the table before taking the second cut. When finished, the work is invariably flat and parallel.

Methods of Machine Tool Design

Continuation of Third Article—Machine Tool Drives—Some of the Possible Combinations of Gears and Countershafts—Beginning a Problem

BY A. L. DELEEUW

AN UNLIMITED number of combinations is possible, using such elements as fast and slow countershafts, cone pulleys, fast and slow back gears, fast and slow triple gears. More than two countershaft speeds can be used, and have been used; it is possible to put a speed variator in the countershaft; it is also possible to have two cone pulleys in the countershaft. Such combinations have appeared from time to time; some have been discarded while a few still survive; and, where it is possible to use them, such combinations may produce very desirable results. However, there is one item which must be constantly kept in mind when we use more than one countershaft speed and even with the use of an ordinary set of cone pulleys, and that is, that the amount of power delivered to the machine is not constant. If, for instance, we have a machine cone and countershaft cone, each with a large step of 12 in. and a small step of 6 in. for, say, 4-in. single belt, and supposing the countershaft to run 300 r.p.m. then the large step of the countershaft cone is capable of delivering 5¾ hp. If the belt had been on the small step of the cone, the amount of power delivered would be only half as much, or 2⅞ hp. Not only have we here a wide variation in the amount of power which the countershaft can deliver, and consequently in the amount of work the machine can do, but, as a rule, we have the maximum amount of power when the minimum is required, and vice versa.

Supposing that the above-mentioned cones were used in a lathe, then we would have the high speed of the

a	ar	ar^2	ar^3	ar^4	ar^5	ar^6	ar^7	ar^8	ar^9	ar^{10}	ar^{11}	ar^{12}	ar^{13}	ar^{14}	ar^{15}	ar^{16}	ar^{17}	ar^{18}	ar^{19}
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1 To 16 All In Cone																			

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Slow Countershaft								Fast Countershaft							
or	Back Gear								Direct							

1	3	5	7	9	11	13	15	2	4	6	8	10	12	14	16
Slow Countershaft								Fast Countershaft							

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Slow Back Gear						Fast Back Gear						Direct					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Back Gear and Slow Countershaft					Direct with Slow Countershaft					Back Gear and Fast Countershaft					Direct with Fast Countershaft				
or	Back Gear and Slow Countershaft					Back Gear and Fast Countershaft					Direct with Slow Countershaft					Direct with Fast Countershaft				
or	Triple Gear					Slow Back Gear					Fast Back Gear					Direct				

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Slow Triple Gear				Fast Triple Gear				Slow Back Gear				Fast Back Gear				Direct			

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Slow Back Gear and Slow Countershaft			Slow Back Gear and Fast Countershaft			Fast Back Gear and Slow Countershaft			Fast Back Gear and Fast Countershaft			Direct with Slow Countershaft			Direct with Fast Countershaft		
or	Slow Back Gear and Slow Countershaft			Fast Back Gear and Slow Countershaft			Direct with Slow Countershaft			Slow Back Gear and Fast Countershaft			Fast Back Gear and Fast Countershaft			Direct with Fast Countershaft		

VARIOUS COMBINATIONS OF DRIVING ELEMENTS

lathe when the belt is on the large countershaft step, and the low speed when it is on the small step. Now, as a rule, we do the heavier work when the lathe is running at the lower speeds and this is exactly when we obtain the least amount of power.

The same thing happens when we have variable-speed countershafts and this defect becomes more marked the greater the difference in the countershaft speeds. For that reason countershaft speeds widely varying in the number of revolutions per minute are not often used.

The table on the preceding page shows some of the combinations which are possible when we use sucn elements as fast and slow countershafts, cone pulleys, slow and fast back gears, and slow and fast triple gears.

As was mentioned before, many other possibilities exist, and some of the groupings given here would not be practical except in some extraordinary cases. The first line shows the various speeds we would obtain up to and including twenty speeds. The second line shows the numerals by which we refer to these speeds in the various groupings. The first possibility is that all of the speeds (16 and sometimes more) are obtained by the cone steps only. This, of course, is not a practical arrangement, though there are cases where as many as nine steps in a cone are used in very practical constructions—for instance, speed variators for a grinder.

The second group uses either a pair of cone pulleys combined with slow and fast countershaft or such cone pulleys with back gear or direct drive. Here, again, it is not very likely that eight steps will be used in the cone, but the general nature of the drive remains whether we use eight or only three steps in the cone.

The next group refers to a pair of cone pulleys and again slow and fast countershaft, of a somewhat different arrangement. In the previous arrangement the fast countershaft was not used until all the speeds of the cone had been exhausted with the slow countershaft speed. Such an arrangement is not very practical unless the speed variation obtained in the cones alone is relatively small. In the arrangement shown, the fast countershaft speed is $r^4 \times$ the slow speed, and this would either mean an excessively high countershaft speed or an excessively low speed. In the present arrangement, however, the countershaft speeds alternate with the cone steps. For instance, if we have the belt on the third step and with the slow countershaft speed, we will obtain the next higher machine speed by leaving the belt on the third step but changing over to the high counter speed. The next higher machine speed will then be obtained by shifting back to the low counter speed and also shifting the belt to the fourth step of the cone. In this arrangement the ratio of the countershaft speeds is r. Such an arrangement is quite frequently used because we may use then the low counter speed for roughing and the high speed for finishing, obtaining these speeds without having to shift the cone belt and merely handling the shipper rod.

The next case shows a pair of cones, one countershaft speed, two sets of back gears and a direct drive; the next, two countershaft speeds, two cone pulleys and back gears. Here, again, we have a large difference between the two counter speeds, which makes this arrangement unsuitable except for very special cases. In general, the tabulation shows what arrangements are possible, though not necessarily desirable.

In Figs. 16, 17 and 18 a number of groupings were shown fo three or four shifts. The number of shifts which should be selected for a machine depends on circumstances. If the work done by the machine calls for frequent shifting of speed within a narrow range, then it is well to control this entirely with one shift. If, on the other hand, there is a frequent shift,

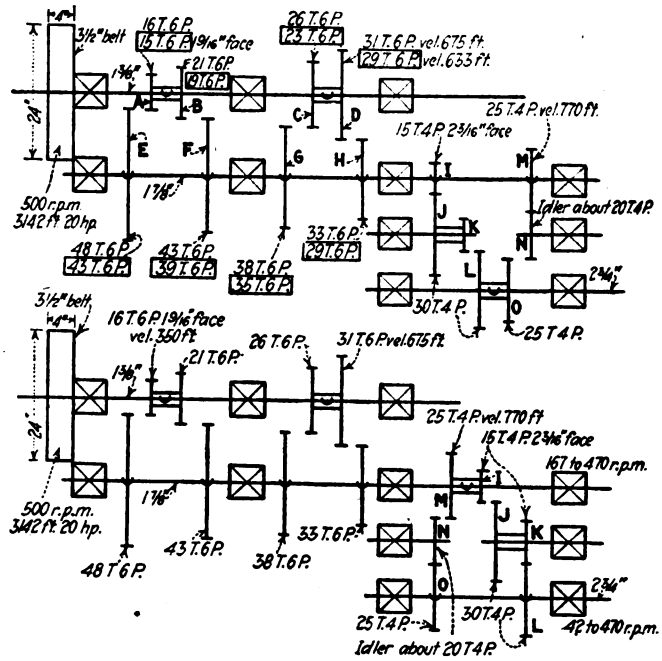


FIG. 20-A. FIRST ARRANGEMENT OF EIGHT-SPEED GEAR CHANGING DEVICE (ABOVE). FIG. 20-B. BETTER ARRANGEMENT OF FIG. 20-A

say from roughing to finishing feed (which is probably more than the variation one could get in one group), then it is well to bunch the finishing feeds and also the roughing feeds together, each in their own group, and have a single shift from roughing to finishing. No general rules can be given in regard to this matter and if we wish to illustrate the analysis of a gear-changing device, we must assume certain conditions and proceed accordingly.

In Fig. 20A a gear-changing device is shown with eight speeds. There is a driving pulley on the first shaft which, we will suppose, runs 500 r.p.m., giving a belt speed of 3,142 ft. per minute and capable of transmitting 20 hp. There are two pairs of sliding gears which can be made to mesh either with an idler or with a pair of compound gears which, in their turn, mesh with a pair of gears keyed to the second shaft. This arrangement may or may not be the best we can get. It is, however, the first one we happen to think of and is therefore the starting point of our analysis.

We will assume that we desire to run the last shaft

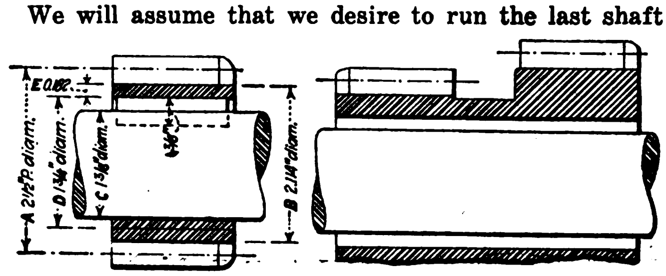


FIG. 21. STANDARD METHOD OF RECORDING PINION ANALYSIS

at a low speed of 42 and a high speed of 475 r.p.m. As we have two shifts we will have the same conditions as if we had a pair of cone pulleys and a set of back

gears; so that we can calculate at once what reductions we must make in the first shift and what in the second. The question remains whether we have the same as Case 1-A or Case 1-B. If we should make the sliding gears on the first and second shaft in the same manner as the cones in Case 1-A, we would have the same gears on both shafts, that is, gear *A* would be the same as gear *H*, and *B* the same as gear *G*. If we did so, we would have to speed up from *D* to *H* and from *C* to *G*, and as we do not wish to speed up in gear arrangements except under unusual conditions, we must naturally arrange our gears as in Case 1-B, that is, two cones but not with the same sizes of steps.

As it is desirable to have the gears as small as possible we start out making gear *A* with 15 teeth, and we will further make gears *D* and *H* of the same size. Under these conditions we find that the various gears have the numbers of teeth as indicated in the oblongs in the sketch. The calculations follow:

Desired speeds 42 to 470

No. of speeds = 8

Range = 470 ÷ 42 = 11.2

Ratio $= \sqrt[7]{11.2} = 1.412$

Sequence of speeds

a	ar	ar²	ar³	ar⁴	ar⁵	ar⁶	ar⁷
42	59.3	83.8	118	167	236	333	470
SLOW COUNTERSHAFT				FAST COUNTERSHAFT			

CASE 3

Range in cones $= r^3 = 2.8166$

Ratio of fast and slow counter $= r^4 = 3.98$ say 4.

Ratio of *A* and $E = r^3 = 2.8166$

A has 15 teeth

No. of teeth in $E = 15r^3 = 42.2$

15 + 43 = 58 T. in pair *A* and *E*

$$B = \frac{58}{r^3+1} = \frac{58}{2.995} = 19$$

$$F = 58 - 19 = 39$$

$$C = \frac{58}{r+1} = 24$$

$$G = 58 - 24 = 34$$

$$D = \frac{58}{1+1} = 29$$

$$H = 58 - 29 = 29$$

$$ar^4 = \frac{470}{1} \times \frac{15}{43} = 164 \qquad a = 164 \div 4 = 41$$

$$ar^5 = \frac{470}{1} \times \frac{19}{39} = 229 \qquad ar = 229 \div 4 = 57$$

$$ar^6 = \frac{470}{1} \times \frac{24}{34} = 332 \qquad ar^2 = 332 \div 4 = 83$$

$$ar^7 = \frac{470}{1} \times \frac{29}{29} = 470 \qquad ar^3 = 470 \div 4 = 118$$

Before we can go further we must determine the pitch and face of these gears. We will assume that the reader is familiar with this process. We will make the gears of chrome nickel steel, heat-treated and hardened, because we realize right away that, in order to transmit 20 hp. at 500 r.p.m., we would need very large cast-iron gears of which the circumferential speed would be very much too high and soft steel gea[illegible] not be permissible on account of the tearing [illegible] under running conditions. We might h[illegible] gears of mild steel and casehardened, or of tool steel and hardened, but the latter choice is unsuitable because hardened tool steel is brittle, and the former choice would be almost as expensive as chrome nickel steel and would not have nearly the same strength.

Making pinion *A* with fifteen teeth, six pitch, and therefore 2½ in. in diameter, makes gear *D* with twenty-nine teeth, six pitch. As gear *D* runs 500 r.p.m. its circumferential speed is 633 ft. per minute. *Without resorting to special care in gear cutting, hardened steel gears may run up to 700 ft. per minute, when running dry.* Our arrangement is therefore acceptable.

However, comparing the load which the pinion *must* stand and the load it *can* stand, we find that pinion *A* is not strong enough. There are two things we can do: We can either increase the pitch or increase the number of teeth. The smallest possible increase in pitch would make the pinion fifteen teeth, five pitch, and, as we cannot change the relative sizes of *A* and *D*, the diameter of *B* also will be $\frac{6}{5}$ times greater, so that its circumferential speed will be 633 × $\frac{6}{5}$ which is more than 700 ft. per minute, and therefore not acceptable.

If, on the other hand, we change the number of teeth of pinion *A*, we increase it only $\frac{1}{15}$ or less than 7 per cent for every tooth added. Giving this pinion sixteen teeth reduces the load sufficiently to make such a gear strong enough, and, as this pinion is the smallest of the eight gears used in the set, all other gears are also sufficiently strong. The new figures thus obtained are placed immediately above the old figures in the oblongs. We find that the highest circumferential speed of any of the gears is now 675 ft. per minute, which is still below the maximum.

It might be remarked here that there are two shifts in the first group but this is only apparently so. The two sets of sliding gears can be handled with a single lever as is done in the gear-shift on automobiles. The reason why a single lever can be used for two pairs of sliding gears in one group is that only one of the four sliding gears is in mesh, all others run idle. If, on the other hand, gears *A*, *B*, *E* and *F* should belong to one group and gears *C*, *D*, *G* and *H* to another group, it would not be possible to handle these two sets of sliding gears with a single lever, because two sets of gears would be running at the same time.

The highest speed we have given to the second shift is 470 r.p.m. and the lowest speed 167 r.p.m. As the last shaft in the arrangement must have a low speed of 42 r.p.m., we find that we must reduce from 167 to 42, which is a ratio equal to 4. Such a reduction is very well possible with one pair of gears, but it would mean that the lar[illegible]er of the two gears would be of considerable size. [illegible] modern machine tool construction where gears [illegible]posed to be inside of the frame of the machine (a[illegible] as much as possible), large gears are not desira[illegible]d for this reason we will make this reduction by [illegible] of compound gears, indicated by *I*, *J*, *K* and *L*. [illegible]ther side of this sliding gear arrangement, howev[illegible]ires no reduction, so that we do not need any con[illegible]ing. However, if we should drive directly from *M* [illegible], the last-mentioned gear would run in the opposite d[illegible] from gear *L*, so that we are compelled to insert th[illegible] *N*.

As the highest speed of pinion [illegible]y 167 r.p.m., and as it also has to transmit 20 hp., [illegible]st calculate [illegible] pitch and face for this pinic[illegible] find that [illegible] it four [illegible] again

as our material. The real active face is only 2 in., as $\frac{3}{16}$ in. was allowed for the rounding of the teeth which is necessary where gears slide into mesh with each other. Similarly, the face of the first pinion, which was $1\frac{9}{16}$ in., has also an allowance of $\frac{3}{16}$ in. for rounding. It should be noted here that *the face of a gear should not be more than three times its circular pitch and, if possible, should be confined to two-and-a-half times the circular pitch.* There are cases where we deviate from this rule, but every case should be treated individually and carefully analyzed before we make the face wider.

The reason why it is not advisable to have wide faces for gears is the following: However carefully shafts may be aligned, there is always some small amount of error. Besides, the pressure on the gear tooth or possibly on the teeth of some other gear will cause the shaft to bend, thus bringing the teeth of two meshing gears out of alignment. This will cause excessive pressure on the corners of the teeth, which are liable to break out. Actual practice shows that in the great majority of the breakage of gears it was the corner of a tooth which first gave way.

We will now check up and see if there is anything in the arrangement, as sketched out in Fig. 20A, which should be modified. Looking at the first pair of sliding gears we see that when it is in mesh on either side the working gear is close to a bearing, which is as it should be. But this is not the case with the compound gears. Where the gear *L* meshes with *K* is quite some distance from its bearing. Furthermore we notice that the sliding gear *L-O* is on the last shaft, that is, the shaft subject to the greatest torque; and it would be better to have all gears on this shaft solidly keyed on. We further notice that the gear *L* receives heavier pressure from the compound gears than the gear *O* from the direct drive, and we should always aim to place the gear which receives the heaviest pressure as close to the end of the shaft as possible. In other words, we should reverse gears *L* and *O*. We make these corrections and obtain Fig. 20B, which meets all the objections mentioned above.

There is one other point to which we should pay attention, namely, the idler. It would seem desirable to have the compound gears *JK* and the idler *N* in line with each other so as to be able to run a single shaft between the bearings for the support of these gears. If we do so, we must make idler *N* with twenty teeth. As a rule, it is not desirable to have an idler between two gears smaller than the gears themselves, though this is not a serious matter so long as the difference in the number of teeth is not too great. Twenty teeth, therefore, will do. However, should we wish to make this number greater we can readily do so, for we must not forget that Fig. 20B does not show the gears in actual relation to each other, but shows them as if they were all rolled out until the centerlines of their shafts came in one plane surface.

Mention was made of the analysis of the fifteen tooth pinion, which showed us the necessity of changing this to sixteen teeth. As this kind of analysis should be carried out with every gear, clutch, etc., which we need in a driving arrangement, we show in Fig. 21 a standard way of making such an analysis rapidly and in such a manner that a record may be kept. The sketch on the left shows the fifteen tooth pinion which does not need to be sketched to size, as we will depend entirely on figures. We put down the various sizes in the order indicated by the letters. *A* shows the pitch diameter, *B* the root diameter, *C* the diameter of the shaft, *D* the diameter over the key (or over the bushing, if the gear should be running loose on the shaft), and *E* the thickness of metal between the teeth and the key. This amount of metal being insufficient we changed the pinion to sixteen teeth and drew a new sketch as shown on the right.

(Continued in next week's issue.)

A Difficult Die Casting

By Milton Wright

A rather difficult proposition in the way of a die casting is shown in Fig. 1. It is of an aluminum alloy and, except for tapping the small holes for the assembling screws, is complete when it leaves the die. The picture shows two identical castings, one of them reversed to enable the reader to see both sides. The depth of the casting, the extreme thinness of the walls, together with the various shoulders, crossholes, offsets,

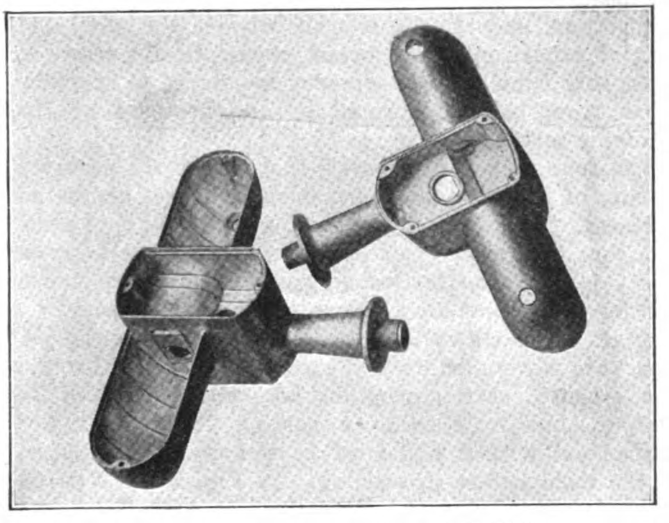


FIG. 1. A DIFFICULT DIE CASTING

and recesses, combine to render the task of design as well as construction anything but an easy one.

As anyone familiar with the art of die-casting need not be told, the difficulty of the process lies not so much in the making of a die that will produce the casting, as in designing it so that the casting may be removed from it without injury. In ordinary foundry practice where the molds are of sand, a mold is made and destroyed for each casting produced. Any shoulder, offset or recess from which the pattern may not be withdrawn without injury to the mold is taken care of by "cores" made up of sand and bonding material, and as many sets of cores are therefore required as there are castings to be made.

When the mold is a steel die, not only must it be so designed that the casting will come out but all cores must be so made that they can be withdrawn before the mold is opened, or must come out with the casting in such shape as to be ready for instant replacement for the next cast.

In the die for making this casting, both parts of which are shown in Fig. 2, there are two loose cores that come out with the casting when the latter is removed from the mold, as well as several others that are so arranged as to be withdrawn from the casting by means of levers and pinions.

The upper faces of the parts, as shown in the illustration, are the mating faces—the parting line—of the mold, and it will be noted that this does not lie in a single plane, but has an offset of about ⅜ in. In casting position this face is vertical, the sides *A* being at the bottom, and the die is held between the anvil and ram of a horizontally disposed, pneumatically operated press that supplies the necessary resistance to keep the parts from being separated by the pressure of the incoming metal.

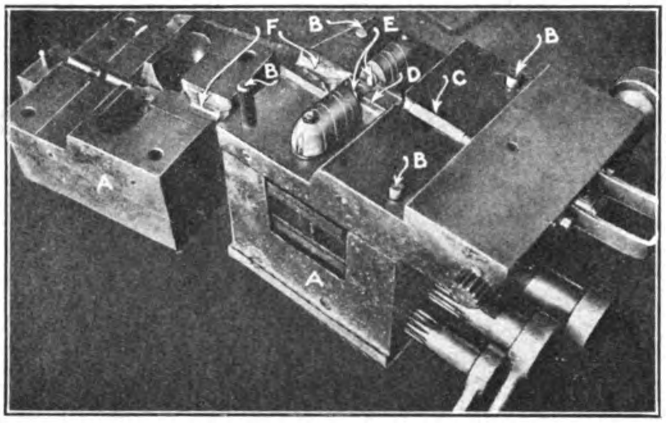


FIG. 2. DIE USED IN PRODUCING CASTING

The four pins *B* are dowels that insure the accurate mating of the dies, and permanently project above the surfaces. The stem of the casting is hollow and at *C* is a core that makes this hole. In casting position the core *C* is somewhat farther advanced than is here shown and meets the part *D*, which is also a movable core

At *E* are the two loose cores previously mentioned. They are dovetailed into the solid portion of the die and, when in casting position, become a portion of its contour, but in ejecting a casting these parts are pushed out with it and must be removed and replaced in the mold before proceeding. In Fig. 3 these parts, marked with the same letter, are shown as they have been set back in the mold but have not been pushed down to place.

In Fig. 3 it will be noted that many small pins that are not visible in Fig. 2 project from the parting surfaces of the die. Some of these are cores for the small screw holes but most of them are ejector pins for pushing the casting out of the mold. All of these pins are operated by the various levers that may be seen in Fig. 2. The ejector pins are, of course, flush with the surface of the die and form a part of it when a cast is made, while the core pins are left projecting to form the holes.

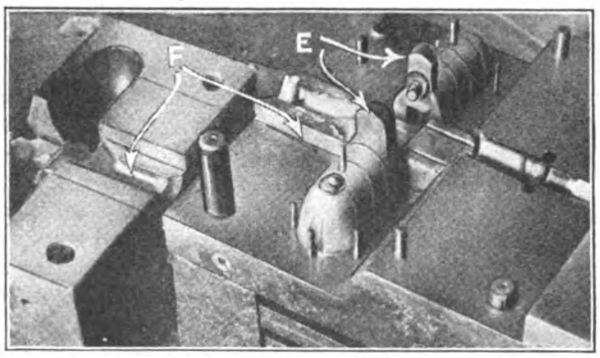


FIG. 3. DETAIL OF THE LOOSE CORE

The openings, marked *F* in both Figs. 2 and 3, together form the sprue through which the molten metal enters the die. When the two parts are together this, at the outer end, is a round hole the entrance to which is beveled or countersunk to match the correspondingly beveled spout of the pump.

The machine that does the casting was developed by the Atlas Die Casting Co. for its own use and cannot, therefore, be described. Suffice it to say that the spout of the pump, which is suspended in the pot of molten metal, is forced against the opening of the sprue and, while firmly clamped in position, air at 200-lb. pressure is admitted to the pump, shooting the molten metal into the die and effectually filling every crevice thereof.

Upon opening the die the first move is to withdraw all the cores by means of their respective levers. The operator then pulls forward the lever connected with the ejector pins, pushing the casting slowly and evenly out of the die. It will be noted in Fig. 3 that there are ejector pins under the loose cores *E*, so that these parts are pushed out with the casting and no strain is imposed upon the latter, which at this stage is very fragile because of its heat.

This die was designed by Nathan Lester, engineer of the Atlas Die Casting Co., as was also the casting machines used by this company.

Literal Obedience

By Robert Grimshaw

In certain classes of work there are reasons why instructions should be obeyed literally; other action would involve fruitless discussion and costly, even fatal delay. Whether all orders shall or shall not be obeyed to the letter; whether as the printer says, one must "follow copy, even if it goes out of the window"; whether, as the common phrase goes, one must "obey orders, even if it breaks owners,"—depends on the class of work, the type and experience of the worker, and the degree of emergency. One thing is certain:—where orders are in writing and are understood, responsibility for any undesirable consequence of following them to the letter is readily placed.

At the same time, if the foreman sees beyond all question that orders sent him are impossible to follow literally, or if so followed would bring about trouble, it is his duty to say so, at once; just as it is the duty of an apothecary who finds an error in a prescription, to communicate at once with the prescribing physician.

Erratum

We hasten to correct an error which appeared on page 688g in our issue of May 4. In the Clipping Index description of the portable automatic punch for hardness testing the word "scleroscope" was used in the title. Our attention has been called by the Shore Instrument and Manufacturing Co. to the fact that "scleroscope" is a registered trademark in the United States Patent Office and cannot be used except in connection with the device made by this firm. We wish to say that the Case Hardening Service Co., of Cleveland, distributor of the punch, is blameless in this matter as the word scleroscope was added to the title of the description through a clerical error in our own office. We shall publish in an early issue a corrected Clipping Index description to supersede the one in the May 4 issue.

The Grinding of Gear Teeth
and Its Future in the Industry

Conclusion—Application of Ground Gear Teeth in the Automotive Industry—Overcoming the Effects of Heat-Treatment—Elimination of Noisy Gearing by Grinding

By R. S. Drummond
Vice-President, Gear Grinding Machine Co.

As a sample of the stock removed from gear teeth by grinding process, figures are given bearing on gears similar to those in automobile transmissions, varying in size from 2 in. in diameter to 8 in., of 6 or 7 pitch, and ⅝ to 1¼-in. face, either casehardened or oil-treated.

On such gears it is usual to correct the tooth curve and give a good finish to the tooth surface by the removal of approximately 0.003 in. from each side of the tooth. Where the inaccuracies of machine work or the distortion of heat-treatment is rather excessive, it sometimes becomes necessary to remove as much as 0.006 in. from the surface of the tooth on both sides. The removal of this amount of stock, 0.003 to 0.006 in., will remove from the thickness of each tooth from 0.006 to 0.012 in., adding that much to backlash in a given gear, or double this amount in a pair of gears meshing together. We find that on the average we can expect the backlash to increase 0.010 to 0.015 in. in commercial transmission gears, due to the removal of stock by the grinding process.

Permissible Backlash

This brings up the important subject of backlash and its effect on gear operation with respect to uniformity of transmission of power and noise. It has been our experience over several years that transmissions are normally helped by increase of backlash—for a long time manufacturers of this product held the backlash so close (0.004 to 0.006 in.) that a serious oil hammer was evident, especially in cold weather. As the backlash increased this disappeared.

In the normal operation of gears 0.022 in. backlash has been found highly satisfactory in high grade transmissions. The only unsatisfactory result of additional backlash comes from the accumulated backlash between a series of gears where the driven member over-runs the driver—as in a car coasting against the engine. This will accumulate the backlash, and cause the gears to tap against one another with a single distinct tap, which is normally not objectionable in automobile transmissions. It is unusual for drivers to continuously surge their cars backward and forward.

Casehardening

The depth of casehardening of such gears, which is usually specified 0.035 in. or more, is amply sufficient to permit of the grinding of gear teeth for salvage purposes, or for finishing gears with grinding stock allowed, without alteration of casehardened limits. A reduction of 0.006 in. from the specified 0.025 in. minimum will still leave ample case. Some manufacturers prefer to make the case 0.040 in. deep and this has proved entirely satisfactory.

Paper presented at Buffalo convention of the American Gear Manufacturers' Association.

In the rapid and economical operation of grinding gear teeth certain machine limits are important. We mention them as follows:

(a) Variations in the bore of the gear may be permitted in automobile transmissions to vary 0.000 to 0.001 in. over specified size.

(b) The hub face may be permitted to run out up to 0.001 in.

(c) Outside diameter may have a run out of 0.005 in. in gears from 2 to 8 in. in diameter.

(d) Index error may be permitted in a rough machine product up to 0.003 in.

Such discrepancies in the rough product are well within ordinary machine limits of machine production without need for special features and accuracy of gear tooth cutting or gear manufacture. The bore and the face of the gear as mentioned are important because it is customary to grind gears in groups of from 1 to 12, according to their size and general proportions.

The limits for grinding stock permit of the elimination of normal errors in run out or index error as mentioned.

Should these errors in run out or indexing or thickness of the tooth be exceeded, it is necessary in finish grinding of the teeth to remove additional material which in turn increases the backlash but otherwise does no harm in transmission gears.

Recommended Grinding Stock

In sleeve gears (main driving pinion and stem gear) it is desirable to fit the sleeve gear with great accuracy into the mating second speed gear with the internal tooth construction. We find on such sleeve gears in the rough the amount of stock desirable is 0.010 to 0.014 in. over desired tooth thickness. This amount of stock permits the grinding of the sleeve gear down to an exact size which will accurately and snugly fit the internal teeth on the second speed clutch connection which is used in direct drive on most cars.

It is usual to leave the teeth of other gears of a normal transmission with 0.006 to 0.012 in. over desired tooth thickness.

These limits of tooth thickness are in common use in the manufacture of several types of transmissions with a backlash in the main driving gears of 0.008 to 0.012 in. backlash and in other gear combinations from 0.012 to 0.020 in. backlash.

In discussing this general subject of removal of stock, it is important to state here that the minimum amount of stock which can be removed is microscopic.

The only tooth form of importance is the pure involute curve. Our experience has proven that the closer the form of the tooth is held to the accurate involute form without modifications the better the gears operate with respect to quiet and accurate operation. Ground gears with proper accurate tooth form will operate

silently unless other features of the construction produce noise.

It is true that certain lengths of tooth and certain involute curves are more particularly suited to a given class of work, as for instance, the development of gear teeth in automobile transmissions has today centered around the use of gears of 6 or 7 pitch and pressure angle of 20 deg. or more. These gears require relief for such interference as occurs from natural abutting of teeth due to the numbers of the teeth in contact. For instance, in 13 teeth running with 14 this abrupt butting of the teeth is due to the number of teeth and is relieved by increasing the pressure angle until the effect disappears. Where this increase in pressure angle is not desired, some transmission cases have been corrected for this defect by the reduction of the outside diameter of the gear tooth to the point which eliminates this interference.

No Universal Tooth Length

There is no one tooth length which is universally correct, although the normal standard full length tooth lends itself best to quiet operation, due to its long period of contact and the fact that one tooth is in full contact when the next tooth following takes hold.

In reading various papers on gearing, one is impressed with the number of times that the theory of action of the true involute is fully described and how little attention is paid to the action of curves which are usual on gear teeth. Examinations of hundreds of lots of gears totaling many thousands, show that the prevalent tooth curves are approximate involutes, but practically never within 0.002 in. of accuracy, unless finished after heat-treatment. As a sample, we would quote one concern whose standards and masters for the last five years have been a misplaced involute located 0.009 in. low on the drive side and 0.005 in. low on the coast.

Teeth accurately formed to the true involute curve will operate accurately and relatively quietly on spread center distance, but in gear cutting it frequently occurs that one of a pair of gears will be off in form and make noise. The action of gears operating with curves placed too high or too low is to cause the gears to move with a speed varying up and down with each tooth action.

Another effect is that the next mating tooth contacts with its mate at a different speed from the mate causing an impact. It is rarely possible to secure double tooth action. This has the effect of giving the full driving force as a wearing pressure on the tooth at the period of greatest sliding action.

Last year we salvaged 50,000 gears for one concern in Detroit. These gears had been previously cut to size and the grinding operation added an average of approximately 0.012 in. backlash, but the gears were quiet after grinding and very noisy before grinding. These gears had improper tooth form when they reached us and we simply ground down the surface of the tooth to a true curve and the gears became quiet. In another instance we ground for an automobile manufacturer during a three months period 35,000 gears which had been put on the shelf during the previous two years as rejected and scrap parts. These gears formerly passed the ordinary inspection as to size and appearance and rolled fairly well, but they were noisy when assembled into transmissions.

The most common error causing gear noise is the misplacing of curves so that after each tooth contact the mating gear is accelerated or retarded abruptly.

Irregular surface contact due to bad shape of the curve applied. This frequently causes the oil film between the teeth to be broken down, giving a metal to metal contact which is noisy.

Improper inspection of cutters or hobbs used in finish cutting gears. It is safe to estimate that 25 per cent of the cutters and hobbs offered on the market are sufficiently inaccurate to cause gear noise unless some master adjustment is made on the machine to modify their effect. When one considers the large number of rejected cutters it is uncomfortable to consider what becomes of these parts which are returned to the manufacturer.

The usual practice of locating the bore of the gear by use of pins between the teeth when the gear is required to operate on a splined shaft causes noise. The object of the number of pins between the teeth is to centralize the bore with the distorted or misformed teeth and at its best this practice only divides the error which is present in the teeth held by the pins. This method does not eliminate the error; it simply divides it. In gear grinding practice it is recommended that the gears be central from splined grooves when the bore is ground. This centralizes the bore with the splined grooves, the gear is then mounted on this ground bore and the error is removed from the teeth so that all three parts are centralized, the gear teeth, the bore and the splined grooves.

The fit of the main driving pinion into the second speed gear is another cause. This causes a very distasteful rattle when the fit is not accurately made. In gear grinding practice it is easy to grind the driving pinion to size not only within the proper limits, but so that it makes a close fit in the space provided in the second speed gear.

Undue stubbing of teeth is another frequent cause for noise. This arises from the adoption of a stub design because it is easy to say "stub," rather than because this combination of length or pitch is a good design. In a recent job handled by us stub teeth were recommended and used by a manufacturer where the shafts were normally spread up to 0.015 in. and the gears were made with a normal amount of undersize on the O. D. and normal amount of eccentricity. Although these conditions were known, the manufacturer supplied these stub teeth and a totally unsatisfactory job resulted. The teeth would not carry over properly from one to the next, there being bearing on the end of the receding tooth of only about 0.008 in. from the top when the next tooth came in contact.

Indicating Tooth Length

There would appear to be no reasonable basis for the present general practice of labeling 6-8, 7-9, etc. as the length of the teeth so indicated are not proportioned to one another. The ratio 6-8 being equal to 0.75 and the ratio 7-9 being equal to 0.77, etc. It is disastrous to design gear teeth so that one loses its load or takes it up before the other is in full contact, and by full contact we mean more than just edge contact on the end of the tooth.

Gear teeth must not only be long enough to reach from one tooth to the next, but for normal quiet operation they should be enough longer so that the next tooth following will reach a full satisfactory contact

before the receding tooth leaves contact. This must also be effective under normal errors in machining such as run outs, index error, undersize condition, etc.

Under certain conditions stub teeth can be produced faster than long ones. This may recommend the machines but it does not necessarily recommend stub teeth. We find the tendency of the market away from this design and transmission builders today are looking with favor on longer teeth and finding that the cost of manufacture is not necessarily greater when conditions of trouble and noise are taken into account. The full tooth gives ordinarily a longer period of contact and lends itself to an easier, less abrupt contact and an easier, less abrupt leaving of contact.

Another feature of design causing trouble is pressure angle. Our forefathers selected 14½-deg. pressure angle just as years ago they selected window glass 6 x 8 in. in size; we followed that practice for years afraid to change—some are doing it yet. All theory and practice point toward improved operation of gears when made with sufficient pressure angle. It is practical to recommend a pressure angle of sufficient degree to avoid modifications of tooth for natural interference. In most transmissions today 20-deg. pressure angle is adopted practice; in some we have used 22½, 24 and 27 deg. The so-called excessive pressure on bearings has not been proved to be an objectionable feature in automobile high speed transmission gears. The mating up of gears of 14½-deg. pressure angle in combinations approximating 14 teeth requires an extreme accuracy out of all proportion when it is considered how easy it is to make the same gears with a larger pressure angle.

Perhaps the chief causes of gear noise in transmissions lies in distortion due to heat-treatment. The cost of distorted gear teeth in rejected gears and tearing down transmissions is so great that it is fair to assume that the cost entailed in grinding the parts accurately after heat-treatment will not exceed the cost of rejections and troubles.

Cost of Gear Grinding

It has been proved that where accuracy or silence of operation are important factors in the gear product, the finish grinding of the gears after rough machining is more economical than the finish cutting of the gears.

The average cost as furnished by several manufacturers for tearing down and changing gears in transmission is \$3 per transmission. The average cost as furnished by several car builders for tearing a transmission out of an assembled car entailing the removal of the car from production assembly, is \$15 per car. The average cost of changing the idler gear where a cap is provided on the side is about 50 cents per gear.

Recently in an automobile shop the number of teardowns of closed car transmissions exceeded sixty per day. In another shop recently the tear-downs involved 50 per cent of all transmission assembled. When gears are being produced in quantities exceeding 1,000 pieces of a kind per month, the finishing by the grinding process is in itself less than the cost of finishing by the cutting process.

In computing the item of cost, it is well to take into account the high cost of finish cutting of gear teeth. All the operations on the gear blank up to the finish cutting can be performed as machine shop operations, not as gear cutting, and it should be properly charged with machine shop overhead, not gear department overhead. Limits of accuracy on the gear teeth when prepared for grinding allow a leeway on the thickness on the tooth as much as 0.005 in.

The roughing operation can be performed at the maximum speed of the cutter and the machine, not as a slowed-up operation. There is no rolling of the gears, no remating of the gears; no rejection for runouts; no rejection for bad curve position, no rejection for index error; no rejection from running gears in power test; no cost of running in gears; no excessive cost of tearing out transmissions are involved when the gears are ground. The production of rough gear blanks finished on the bore and face is a machine operation with machine shop overhead, at least 150 per cent less in cost than gear department overhead.

You should realize further that the scrap gears which are accumulated in the gear shop are largely accumulated after finish cutting. The normal scrap loss in the gear grinding process does not equal 1 per cent.

Wear of Gear Teeth

It is quite improbable that you would accept bearings and shafts, the surfaces of which were as rough as the ordinary gear tooth. You realize that such uneven surfaces would begin at once to wear down the bearings. A recent article on the subject of gear tooth wear by E. R. Ross showed how it began at or near the pitch line, and how it progressed along the gear tooth, spoiling more and more of the surface of the tooth exactly as a rough shaft wears a bearing.

A great deal has been said on the subject of modifying the wear by the use of special steels and very little has been said of eliminating the wear by providing an accurate surface which will tend to avoid the beginning of wear. The ground surface on a tooth lends itself to the avoidance of tooth wear in exactly the same relation and exactly the same extent that a ground bearing on a shaft avoids the beginning of wear.

We have referred to the roughness of the tooth puncturing the oil film. In this connection you will realize that no wear can begin until the oil film between the parts has been punctured or squeezed out. Rough tooth surface punctures the oil between the teeth and starts the wear; also misplaced curves cause abrupt, sharp contacts between the teeth which will puncture the oil film and cause wear. The average surface condition of heat-treated gears would be rejected at sight for any use in a running bearing. When properly designed and made, gear teeth slide and roll on a film of oil with no more wear than is present in a shaft accurately made and operated under well lubricated conditions.

Can you imagine a manufacturer assembling any other power transmission bearing by rubbing it against its bearing with his eyes shut and determining totally by the touch of the finished product whether the parts are mated sufficiently close to operate quietly and without wear? Many times we have heard complimentary remarks about the "appearance of the tooth surface," just as if it were a miracle that it ever looked smooth.

We frequently hear of machine tools with wear on the gear tooth which causes inaccuracy of operation. We expect a big advance in the manufacture of machine tool gears by the introduction of hardening and grinding on these parts. Experience has proved that such gears can be made with great accuracy so that they will operate quietly and without the ordinary well known wear.

Automotive Service Methods and Equipment

X. Home-made Tools for Repairing Ford Cars—A Simple Method of Holding Transmissions for Repairing—A Safety Device—Other Tools

By HOWARD CAMPBELL
Western Editor, AMERICAN MACHINIST

MODERN business has come to depend so much on the telephone as a means of communication that any disruption of the telephone service is considered almost in the light of a catastrophe. Thus it is that immediate and sure transportation of men and materials is a necessity, for which the service station is largely responsible.

The Chicago service plant of the Illinois Bell Telephone Co. includes among its equipment a number of tools and devices that have been developed and made in the plant. One of these is the connecting-rod reaming jig shown in Fig. 1. The base *A* is a solid block of steel, to which the collar *B* is fastened with dowel pins and screws. A small block through which a hole is bored to serve as a guide for the reamer is clamped over the large end of the reamer as shown. A movable block *C* holds the pin *D*, which fits the piston-pin hole in the rod and serves to maintain the center distances between the large and small holes. The block *C* can be moved to accommodate the various sizes of connecting rods.

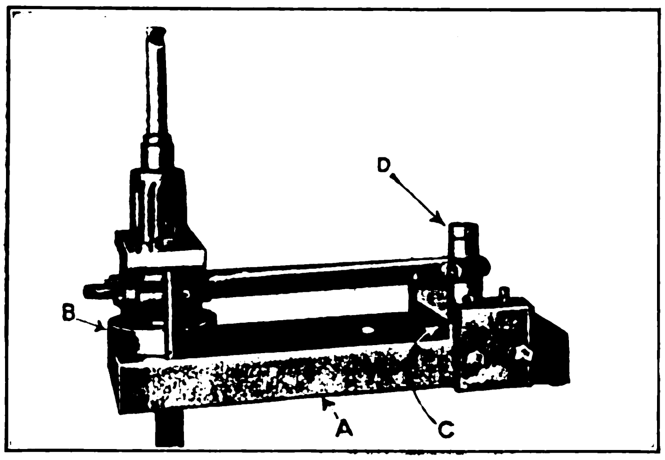


FIG. 1. A SIMPLE CONNECTING-ROD REAMING FIXTURE.

A tool for removing and replacing bushings in Ford pistons is shown in Fig. 2. The piston rests in the V in the block, and the screws shown at either side are screwed against the sides of the piston to prevent expansion while the old bushings are being removed. The lower part of the pin *A* passes through the bushing to serve as a guide, while the upper part is of the same dimension as the o.d. of the bushing. This pin is used both for removing and replacing.

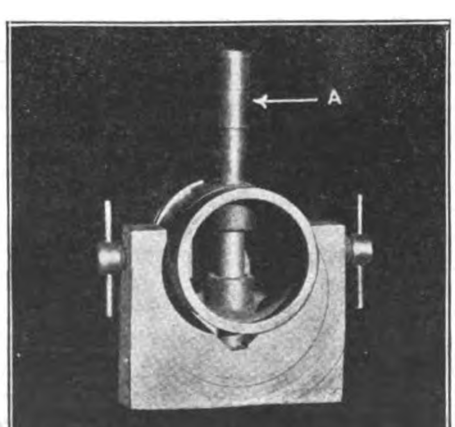


FIG. 2. JIG FOR REMOVING AND REPLACING BUSHINGS

Tools for removing, facing and replacing Ford drive shaft tube bushings are shown in Fig. 3. Tool *A*, only part of which shows in the picture, is turned to a diameter that will allow it to pass through the bushing in the upper end of the drive shaft until the thread is reached.

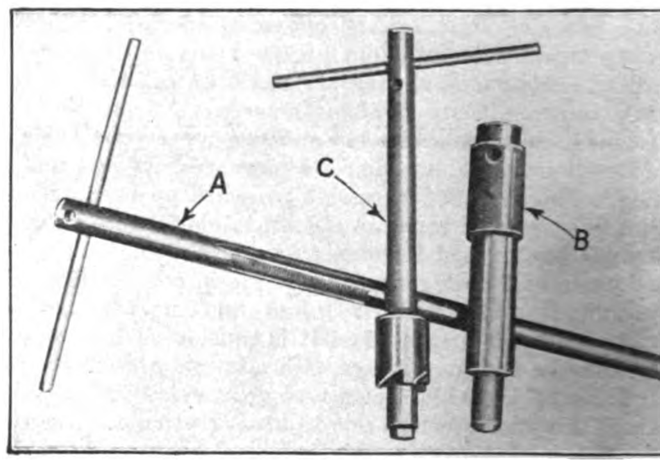


FIG. 3. TOOLS FOR REMOVING, REPLACING AND FACING FORD DRIVE SHAFT BUSHINGS

The thread is screwed into the bushing until it is quite solid, then the rod and bushing can be driven out of the tube from the opposite end. The tool is 66¼ in. long and the thread is eight to the inch, the o.d. at the threaded portion being one inch.

After the old bushing has been removed, the new bushing is put on the small end of tool *B*, and is pressed or driven into place. The small ends of both tools *B* and *C* are turned to sliding fits in the bushing. When the bushing is in place, the tool shown at *C* is used to face off the end of the bushing to allow clearance for installing the universal joint.

Practically every repair man knows how difficult it is to hold a transmission while assembling or repairing it. The sketch, Fig. 4, shows a very simple fixture to which the case can be bolted while it is being worked on. The piece is bolted to the bench through the ½-in. holes in the flat part at the right-hand end, and the transmission case is bolted to the circular part. It is only necessary to use three or four bolts to hold the case, and several sets of holes can be drilled in the fixture, so that it will accommodate several different kinds or makes of cases. The case can be used as a templet in laying out the holes. The piece is of ½ x 3-in. steel, and can be forged to shape in a few minutes. It needs no machining other than the drilling.

We don't see as many broken arms resulting from cranking a car with the spark too far advanced as we used to, but it still happens that a man gets hurt now and then. In Fig. 5 is shown a safety device for Fords, by which the possibility of advancing the spark beyond

the safety point is precluded. The device itself is shown in Fig. 6. It consists of a piece of 1/16-in. sheet steel cut and bent to the shape shown, and attached to the commutator by means of a capscrew and a small machine or stove bolt and nut. The end which slips over the

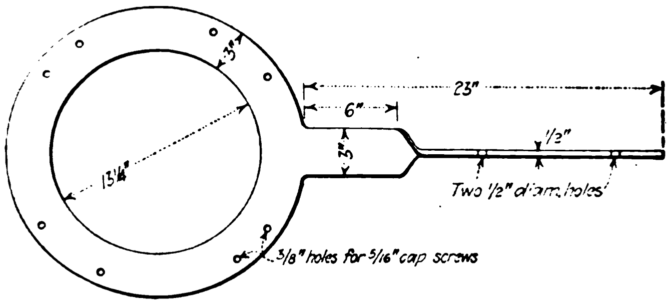


FIG. 4. FIXTURE FOR HOLDING TRANSMISSION CASES

small bolt is slotted, as shown, so that the device can be adjusted up or down. The device covers the depression in the end of the commutator case, but a similar depression can be drilled in the head of the capscrew, which takes care of that feature.

When the spark lever is advanced, the commutator case turns so as to lower the blade of the safety device,

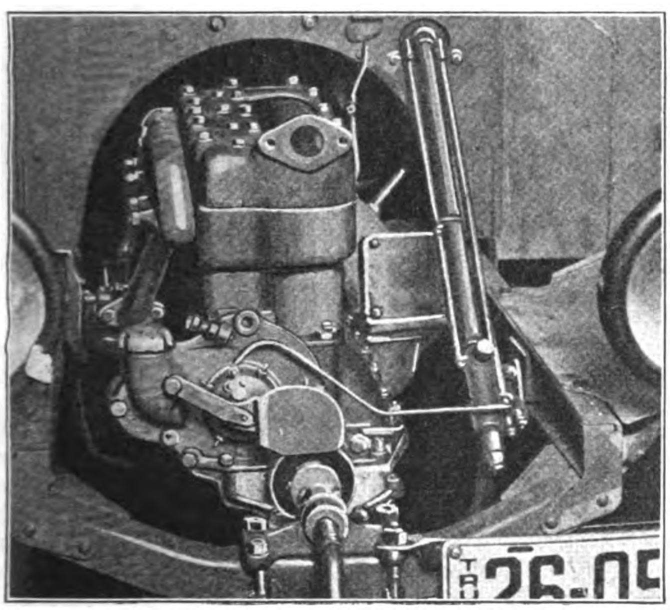


FIG. 5. SAFETY DEVICE ON FORD MOTOR

and when the spark lever is advanced past the point of safety, the blade is down low enough so that the starting crank cannot be engaged with the crankshaft.

A glance at Fig. 7 will show an extra bar extending from one end of the rear spring to the other, and apparently resting on the drive gear housing. This bar is made of 1/2 x 3-in. steel, ground off at a 45-deg. angle at each end so that it will fit into the curve formed by the end of the spring. This bar holds the spring in position while the

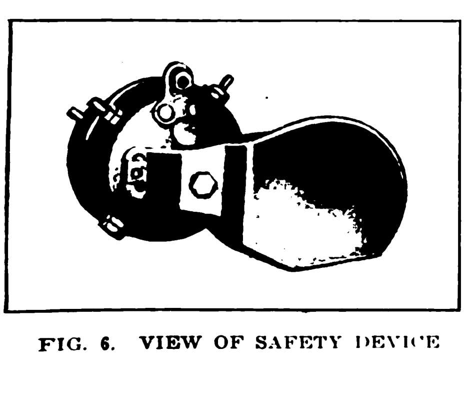


FIG. 6. VIEW OF SAFETY DEVICE

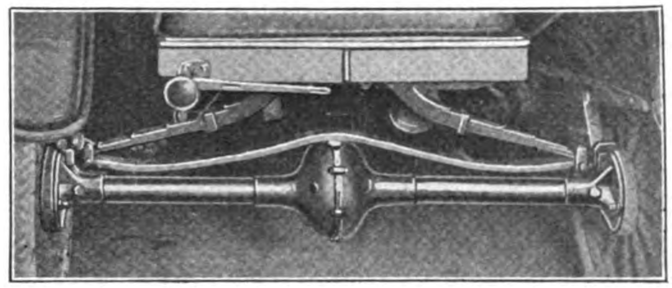


FIG. 7. BAR HOLDING FORD SPRING IN PLACE

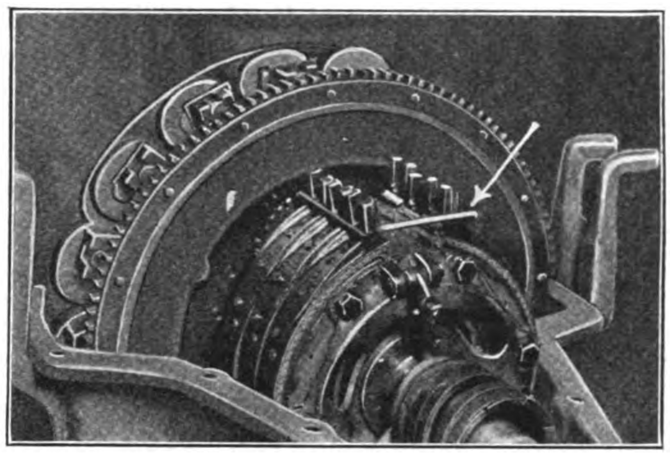


FIG. 8. HOLDING FORD TRANSMISSION BANDS WHILE INSERTING BOLTS

repair man is changing rear axles or spring shackles, or while doing other similar jobs. It should be just long enough so that it will slip in between the spring-eyes easily.

A very simple but time-saving contrivance is indicated by the arrow in Fig. 8. This is nothing more nor less than a piece of wire 3/16 in. in diameter, bent to a letter "U" and offset at the closed end as shown, and is used to hold Ford transmission bands in place until the bolts can

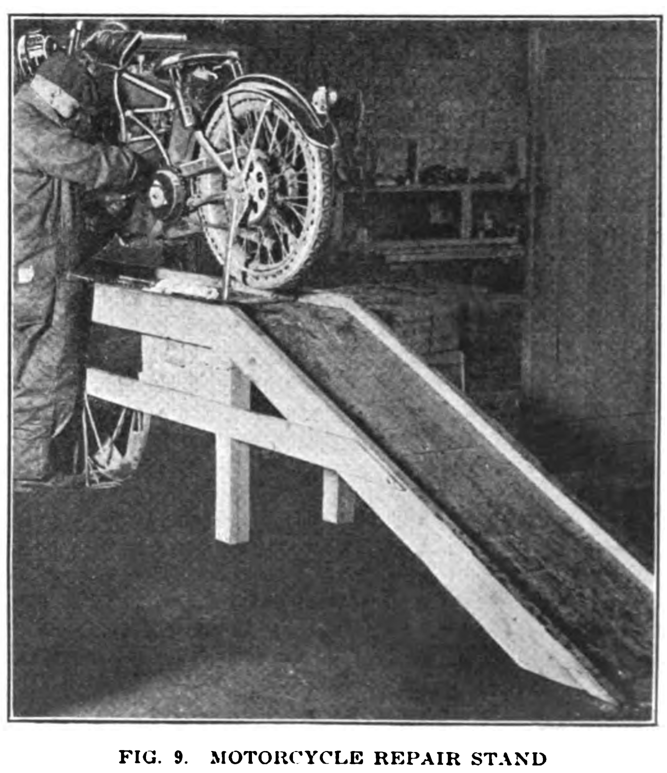


FIG. 9. MOTORCYCLE REPAIR STAND

be inserted, relieving the operator of trying to hold the bands with one hand and insert the bolts with the other.

The dimension between the two legs of the "U" is 2½ in. and the length from the open end to the closed end is 5 in.

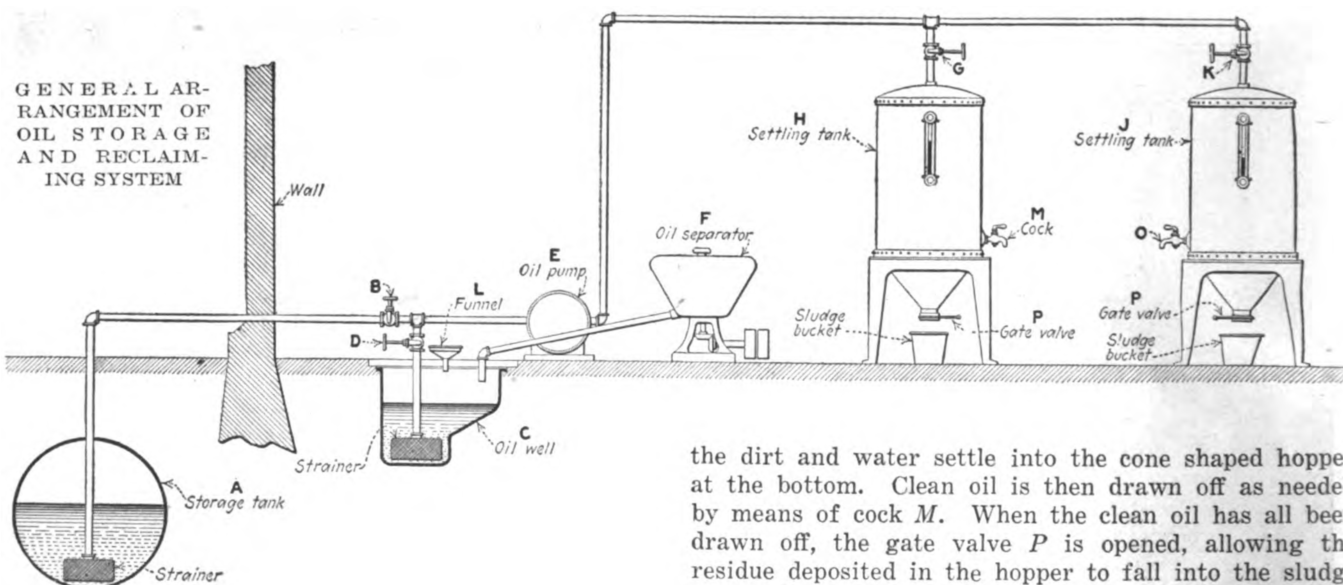
As this company uses a number of motorcycles for getting to the smaller "hurry-up" jobs, it became necessary to erect the stand shown in Fig. 9 so that repairs could be made quickly and easily. The picture tells the story

Increasing Production and Reducing Scrap with Clean Cutting Oil

An Efficient and Easily Built Plant for Handling, Reclaiming and Storing Oil—Its Effect on Production and Spoiled Work

SPECIAL CORRESPONDENCE

THE oil storage system herein described was designed to take care of cutting oil used in the screw machine department of a large automobile shop. Before this system was installed, the practice had been to allow the machines to run with the same oil until it was considered too dirty for further use. The machines were then cleaned out, the used oil thrown away, and new oil furnished to each machine in the department.



GENERAL ARRANGEMENT OF OIL STORAGE AND RECLAIMING SYSTEM

It was soon noticed that a large increase in production was made each time the oil was renewed, and as the quality of the oil went down, there was also a corresponding drop in production, an increase in the amount of scrap, and the tools wore out much more rapidly. This clearly showed that a very important relation exists between the purity and cleanliness of the cutting oil, and the production from the machines. The need of an oil purifying system was thus made evident.

The storage system illustrated was then installed and gave very gratifying results from the beginning.

The general arrangement shows the oil separator at *F*, the oil well at *C*, where the impure oil is collected both from the separator and by pouring through funnel *L*. The main underground storage is at *A* while the two setting tanks are at *H* and *J*.

Just as soon as the oil in the machines begins to lose its efficiency it is pumped out by the oil pump on the machine. The muddy oil and residue, which the machine pump will not remove, is cleaned out and discarded.

The used oil is poured into oil well *C* through funnel *L*. From the oil well it is pumped to one of the settling tanks *H* and clean oil taken from the other tank *J* is supplied to the machines.

The used oil is allowed to stand in the tank *H* until the dirt and water settle into the cone shaped hopper at the bottom. Clean oil is then drawn off as needed by means of cock *M*. When the clean oil has all been drawn off, the gate valve *P* is opened, allowing the residue deposited in the hopper to fall into the sludge bucket beneath. This waste is not used in the screw machines again. It may be used for oiling the road or similar purposes.

The oil from the separator *F* is also piped to the oilwell *C* and receives the same treatment as the oil taken directly from the machines. The flow of oil to the settling tanks is controlled by proper manipulation of the valves *G* and *K*.

The supply of oil is replenished as needed from the outside storage tank *A*. By closing the valve *D* and opening the valve *B* the oil can be drawn from the storage tank and delivered to the settling tanks by the pump *E*.

Before installing this system, oil was purchased in barrels and there was considerable oil lost by leakage and careless handling. The storage tank *A* was made of such capacity that it was possible to buy the cutting oil in bulk, and the waste incidental to handling the oil in barrels was eliminated.

It would, of course, be possible to purify the oil by the use of a filtering system, but the method described above is much quicker, and in practice, has proved very satisfactory.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Device for Setting Up and Laying Out Templets

By S. H. Drake

An angle plate, designed for use in connection with the laying out of a large amount of templet work on which the reading of a good protractor was sufficiently accurate, is shown in the accompanying illustrations. It has a number of advantages over the ordinary angle plate, not the least of which is that it is not necessary to machine a straight edge on the work in order to get an accurate angular setting.

It is possible with this device to lay out centers at points on a line at any angle to a given center line by means of a height gage, and the setting from one position or angle to another is very quickly accomplished.

In Fig. 1, *A* is a regular angle plate of cast iron mounted upon four legs of sufficient height to allow the auxiliary plate *B* to swing. Tapped holes in the latter plate furnish convenient means of attaching work.

At the center of the auxiliary plate is a fixed stud projecting through, and having a bearing in, the main plate. Upon this stud, back of the main plate, is keyed the disk *C*, which is graduated in degrees over the full circle and provided with a vernier *D* from which a reading to five minutes of arc is readily obtainable.

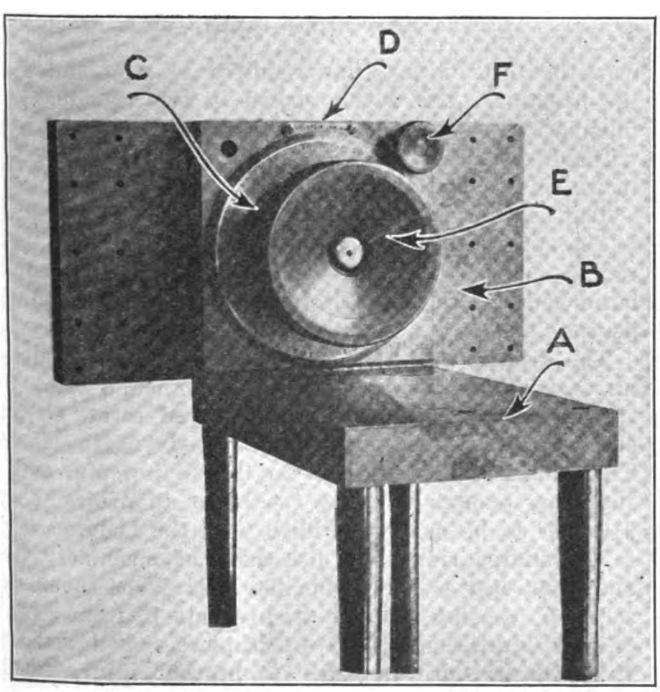


FIG. 1. REAR VIEW OF DEVICE, SHOWING GRADUATED DIAL

The large knurled nut *E*, threaded to the stud, serves to clamp the plate firmly in any position. A tapered locking pin *F*, passing through the main plate and entering correspondingly tapered holes in the auxiliary plate at the four major positions and also at angles of 30, 45 and 60 deg., provides means of setting the device

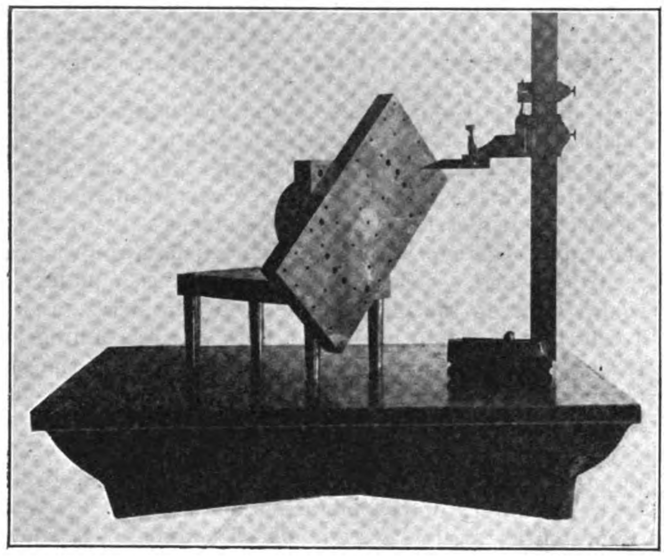


FIG. 2. FRONT VIEW SHOWING HOW DEVICE IS USED

quickly to these positions. Other angles are determined from the dial readings.

In Fig. 2 the face of the device is shown with the auxiliary plate set to an angle of 45 degrees.

Keeping a Belt Tight

By J. T. Towlson

The interesting article under the above title, published on page 227 of American Machinist, was not intended, I hope, to instruct the readers as to how a belt should be kept tight. When any belt drive is in need of such a belt destroying device as the one mentioned in that article would seem to be, it is high time for the boss to look around for some other means of driving.

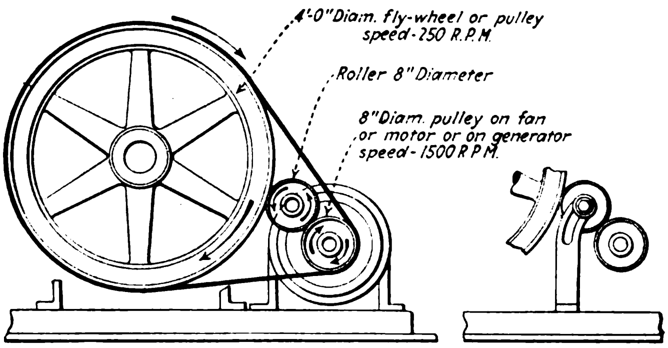
The method defeats the purpose it is intended to effect for the reason that the continual rolling of the pulley on the outside of the belt tends not only to lengthen the latter but to destroy its flexibility, and when that is done the desired result of non-slip drive is more remote than in the beginning.

Correct diameters of pulleys, proper center distances, and a reasonably tight belt of ample width are, in the writer's opinion, far more to be desired than any of the belt-tightening contraptions in use.

Mr. Raworth, sometime editor of *The Engineer*, designed a simple and (then) novel application of a short belt where one pulley is very small and the other relatively large; as, for instance, a low speed engine driving a fan or dynamo, or when a slow moving machine is to be driven direct by a motor.

Referring to the illustration we have, let us say, a

gas engine with a 4-ft. flywheel running 250 r.p.m. belted direct to a generator that has no outboard bearing. Though this is a very convenient set-up where



AN INTERMEDIARY PULLEY ON A SHORT DRIVE

space is at a premium, it is most destructive to the belt because of the short center distance and the extreme tension made necessary by the short arc of belt contact upon the smaller pulley. Even were these factors not considered, the excessive side strain upon the generator bearing would render such a drive impractical.

Mr. Raworth's scheme was to interpose a pulley, or roller, between the main members of the drive in such a way that it would bear upon both, thus assuming the responsibility of carrying the load imposed by the belt tension, no matter how great the latter might be, and relieving the side strain upon the generator bearing.

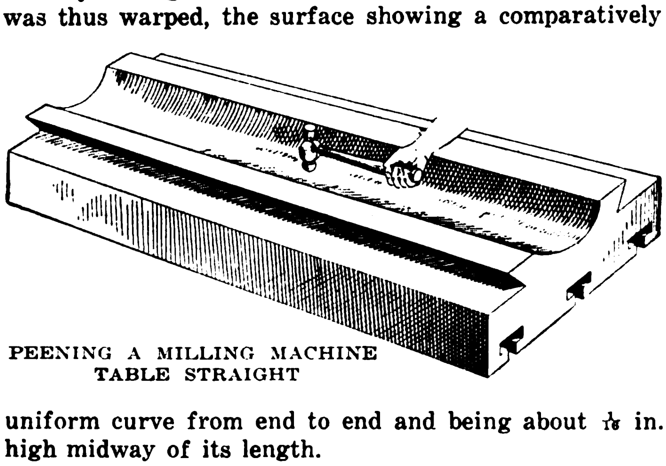
It will be noted that the intermediary pulley is placed in such a position as to be slightly above a line drawn between centers of the main members, for the purpose of providing a little margin of adjustment. It should be mounted upon ball bearings.

Having used this method on several occasions where the necessity for a close-up drive existed and finding it most serviceable and efficient I can recommend it for all similar drives.

Straightening a Milling Machine Table

By A. W. Freeman

It has been my experience to find that the tables of milling machines become warped after years of service under average conditions, because of the peening effect of the numberless small dents in the upper surface. Some years ago I had occasion to repair a table that was thus warped, the surface showing a comparatively



PEENING A MILLING MACHINE TABLE STRAIGHT

uniform curve from end to end and being about 1/16 in. high midway of its length.

We put this table on a planer and took off just enough stock to clean up, and then scraped the table and saddle together. When the fitting was complete we found that the table set 1/32 in. lower in the saddle than before so we were obliged to elongate the holes in the end plates, or screw hangers, in order to bring the screw in line.

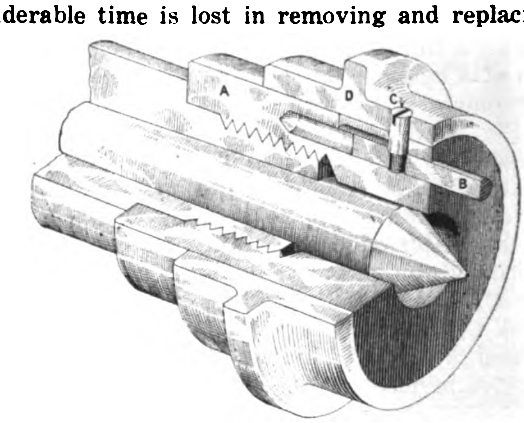
Having a similar repair to make recently, we profited by our earlier experiences and instead of planing the table straight we peened the under surface between the V's and straightened the table as shown in the sketch before any planing was done. This we accomplished in about ten minutes with an ordinary ball-peen hammer, keeping track of the progress by means of a straight-edge and feeler gages.

After the table was straightened in this manner we took off about 0.005 in. from the upper surface to make it smooth, and the job was done. There was no necessity for rescraping the bearing surfaces or readjusting the screw hangers for the reason that practically no stock had been removed and the table was in its original condition.

A Convenient Driver for the Lathe

By C. E. Stevens

In operations in which parts are to be turned on centers or on arbors that are held between centers, considerable time is lost in removing and replacing the



HANDY DRIVER FOR LATHE WORK

work because of the time required to stop and start the machine. The device shown in the accompanying illustration allows the operator to change his work without reaching for the shipper, and has resulted in increased production.

The body *A* is made of machine steel and is fitted to the spindle nose of the lathe in the usual way. The center hole in *A* is large enough to clear the regular lathe center, which projects about 1/2 in. beyond the device.

The driving pin *B* is made of 3/8-in. drill rod and is an easy sliding fit in the body. It has a 1/4-in., 24-thread tapped hole for the shouldered screw *C*, that slides in an elongated slot in the body of the device. This slot is milled parallel to the sliding pin, and is just long enough to allow the latter to project about 5/8 in., or to be pushed in flush with the body.

The sliding ring *D* is also made of machinery steel and is an easy sliding fit on the body. The shouldered screw *C*, passing through it, prevents it from coming off. It is necessary to have this piece smooth and free from sharp edges in order to prevent injury to the operator's hands.

With this device the operator simply pushes back the sleeve, and with it the driving pin, when he wishes to remove the arbor or work from the centers. When it is again in place the sleeve is pushed out and the pin engages the tail of the dog.

What Is the Best Way to Show Sections Through Ribs?

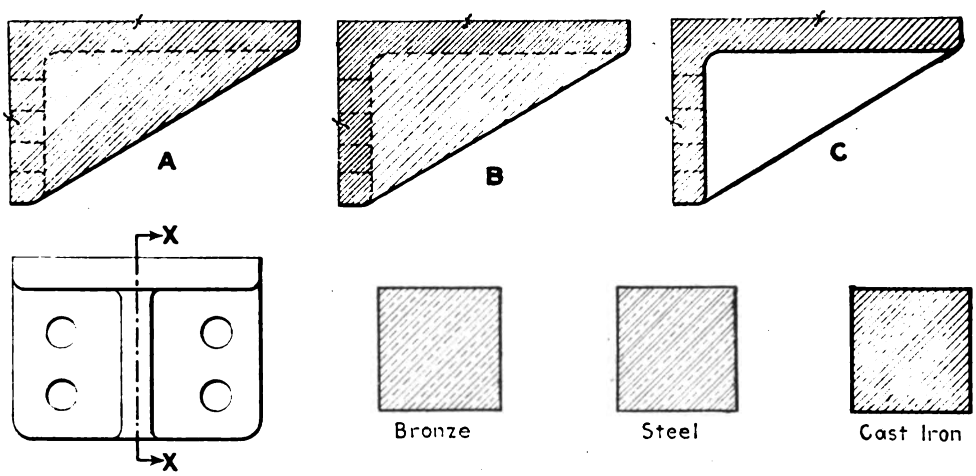
By Aloysius Wilks

Away back in 1915 the late Prof. John E. Sweet started in American Machinist (Vol. 43, page 936) a series of articles or discussions on the "Best Way to Do Certain Things."

The response was not what it should have been. The lack of interest displayed was due, no doubt, to the rush of business in connection with the war then in progress, and everyone was forced to be content with just doing things—without worrying himself much about whether or not he was doing them in the best possible way.

Times and conditions have changed indeed, but the spirit of conservation of material and energy engendered by that trying period still prevails, and its influence is shown in the existence and work of various bodies and committees of standardization. The writer is, therefore, of the opinion that the revival of Prof. Sweet's series would be timely, and to start the exchange of ideas he is submitting for discussion the best way of presenting the cross-section of ribs, spokes, etc., where such are to be shown on drawings.

During the war period I had charge of a class of foreign-born workers to the members of which I was trying to impart a knowledge of the art of reading mechanical drawings. Studying several books upon the subject in the endeavor to establish the best line of attack, I found that most authorities gave three ways of showing cross-section through ribs, as displayed in the illustration herewith, which shows a section taken on the line x x of a shelf bracket.



VARIOUS METHODS OF SECTIONING RIBS

At *A* is the oldest, orthodox and theoretically correct way; something that the up-to-date drafting-room novice might call "according to Hoyle." Notwithstanding the backing of antiquity this method presents serious objections by reason of giving a deceptive appearance of solidity. To remedy this defect, some teachers recommend omitting each alternate line of the section over the rib area, as at *B*; the less dense hatching calling the reader's attention at once to the fact that he has to do with a section through a rib and not with solid material.

This method seems to be much in favor of instructors of mechanical drawing and the majority of students fresh from the schools are familiar with it, but the writer gave it a fair trial and found it wanting. If cast iron were the only material to be designated on drawings this method would serve the purpose, but when we come to adapt the same scheme to the standard sections for steel, bronze, aluminum, etc., we get some very funny results.

I am, therefore, forced to the conclusion that the method shown at *C* is the best; do not cut the rib. It is not exactly or theoretically correct, but may be excused for the same reasons as not cutting through shafts, keys, pins, bolts, and similar parts when there is nothing to be gained by cutting them.

As we have so many conventions in our art, why not add one more? Besides, if you want to keep in the good graces of the efficiency expert, use this method and "slip one over" on old Father Time.

How Can Hindley Gearing Be Gaged?

By Andrew J. Schwartz

The article entitled "Notes on Worm-Thread Formulas" by P. A. Fredericks on page 1043, Vol. 55, of American Machinist, I have found very interesting, and following out the suggestions, I have noted the formulas in my handbook, with reference to the helix angle, limiting it to 3 deg. These formulas, however, apply to straight worm thread; but what about a system for measuring the threads on a so-called Hindley worm? I repeat the appeal of Mr. Fredericks, and solicit the confidence of the makers of the Hindley gearing, to let us know how to measure, or rather how to gage with go and no-go gages the Hindley gears and worms.

It has been suggested that the only way to gage a Hindley worm is to test it against a master gear, and to test the gear against a master worm. By this system it is possible to tell whether or not a gear is perfect and if it will run satisfactorily. But if the gearing is not perfect, this system will not tell the workman how and where to correct the faults, and guesses are often made that result sometimes in ruined work.

Incidently, I have been unable to find a statement of any good points for the use of Hindley gearing, but in numerous books reasons are given why it is not superior to the straight worm gearing. Some of the reasons for not using this class of gearing are:

Its efficiency is no better than that of a straight worm. Hindley gearing is harder to assemble and to adjust, since the worm must be located exactly in three planes.

The worm cannot be ground by mechanical devices on any of its working surfaces.

The hob is expensive as it is difficult to make and cannot be ground.

The worm cut for a given number of teeth in a wheel cannot be used with a wheel of a different number of teeth, although both have the same pitch.

One of the points given in its favor is its superior strength, but a light analysis will show that Hindley gearing is very deceiving in regard to strength. The

threads on the worm do not entirely fill the thread space on the gear, but only a small portion of the threads are in contact. This statement is the result of observations made after blueing a worm and running it in contact with the gear. From these observations it would seem that there is greater strength in a straight worm gearing than in the Hindley type.

The foregoing is getting away from the original subject, but the designing, dimensioning (including tolerances), and the gaging of this type of gearing are very much related. Any information in favor of the Hindley gearing and the methods followed in manufacture and gaging will be greatly appreciated by a large manufacturing plant.

Two Unusual Planer Jobs

By N. L. Pollard

We recently had two rather difficult planer jobs to do and we accomplished them with the devices shown. The castings are cutter-heads for suction dredges used in the Williamette and Columbia Rivers, and are used to loosen up the soil on the river bottoms so that it may be pumped.

The cutter-head shown on the planer in Fig. 1 is about 6 ft. in diameter and of about the same length, with a taper hole 6 x 7 x 14 in. located nearly central in the casting. A keyway $2\frac{1}{16}$ in. long by 1 in. deep

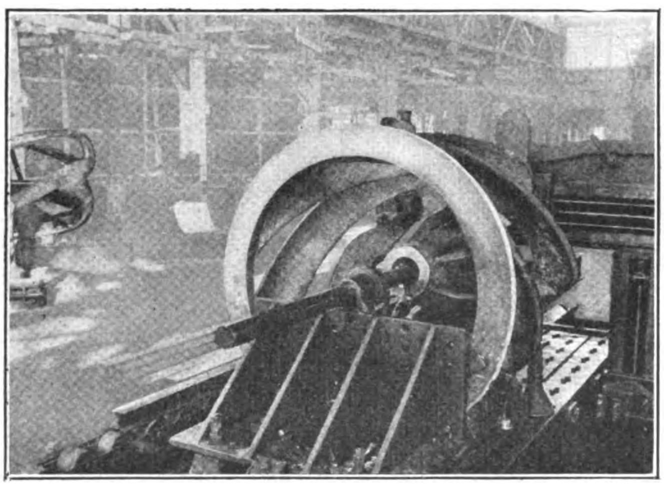


FIG. 1. SET UP FOR PLANING KEYWAYS

had to be cut in this hole. Owing to its location it could not be cut on the keyseater, so by rigging a bar with a bearing clamped to the angle plate as shown, and feeding the tool by tapping it with a hammer, a very good keyseat was planed. Two cuts were taken with a narrow tool and then finished with a tool of the proper width.

The other cutter head, a part of which may be seen in

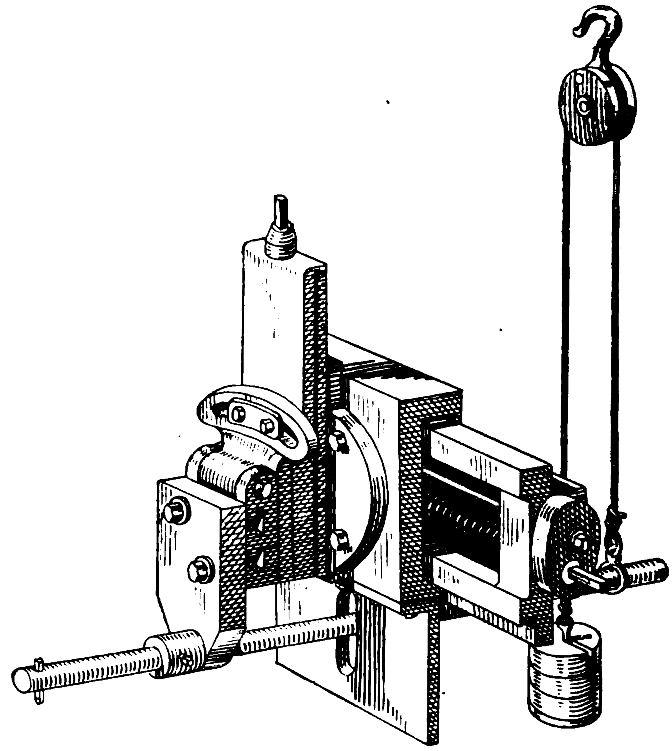


FIG. 2. PLANING A TAPERED SQUARE HOLE

the background at the left in Fig. 1 was larger than the one previously mentioned and had a square tapered hole which had to be machined to 9 x 11 x 18 in. in length, as the head was to be held on its shaft by a draw key. The work was done in a reasonable time by rigging a special tool carrying bar as shown in Fig. 2. The guiding plate was made of 1-in. boiler plate with the slot milled to a nice fit on the bar, and held to the bottom of the planer head by capscrews. The tool was held to the cut by a counterweight hung in the rear of the planer rail.

The hole was first bored to the diameter for about ½ in. on each end to locate it with reference to the other machining operations. Four set-ups were necessary in forming the square; but by planing down the side and across the bottom as far as possible the greater part of the hole was finished in two set-ups, leaving but a small amount in two corners so that the last two set-ups were easy.

Editorial

"They" and "We"

IN DISCUSSING the relation of sales management to industrial engineering at the convention of the Society of Industrial Engineers in Detroit recently, Norval A. Hawkins brought out a point that is as valuable as it is simple and concise. He said that when the salesman refers to the firm that employs him, he always says "we," while the average workman refers to his employers as "they," and that when the employers get that defiant "they" changed to a co-operative "we," better results will be obtained both as to quality and quantity of product, and the differences between the employer and employee will begin to fade. Mr. Hawkins also said that in the institutions with which he has been connected, he has always tried to make the commonest laborer feel that he (the laborer) is a salesman, and that the success of the institution depends just as much on him as on the salesman who delivers the finished article to the ultimate consumer.

A world of thought is contained in Mr. Hawkin's remarks. The difference between "we" and "they" is the difference between co-operation and indifference, and even, in some cases, antagonism. When the employee is brought to realize that his own job, as well as everybody else's from the general manager down, depends on the success of the firm; when he is satisfied that his working conditions have been improved as far as possible; when he is convinced that the firm is paying him the highest wages that will allow a fair margin of profit; when he has been shown that every man who has any part in the manufacture of the product is a salesman, because future sales depend largely on the quality of the work that passes through his hands; when he has learned that he is getting his share of the profits just as surely as any stockholder or officer of the company—then he will discard the "they" when referring to the company or its product and say "we."

Those who are wise will lose no time in doing what they can to hasten the coming of such a day in industry.

Time To Amend

IF ANY further evidence were necessary to prove the need for amendment of the Sherman Anti-Trust Law the present deadlock in the coal situation should supply it. As pointed out in the AMERICAN MACHINIST several weeks ago, one of the decisive factors in the dispute between the coal operators and the miners is the list of indictments hanging over them for violation of the Sherman Law at the time the last wage agreement was negotiated.

The assurances that the operators could meet with the miners' leaders without fear of prosecution were quickly withdrawn after the Attorney-General's visit to Judge Anderson. It is understood that the Justice very properly pointed out that it is not within his power to change the law, and that under the terms of the law as it stands, the representatives of both operators and miners would be liable if they got together to make an agreement. If we admit that a wage agreement is desirable in the coal industry it would certainly appear that some steps should be taken by our lawmakers to permit such an agreement to be arrived at legally.

We have seen the evil effect of the strict interpretation of this somewhat ambiguous law on trade associations. Unfortunately, it seems to hit the good ones as often as the bad ones and gives rise to a feeling of uncertainty as to what can be done legally and what cannot, that is disconcerting to say the least.

Combination in business is not the unmixed evil that certain reformers would have it. It may be abused and result in injury to the community just as other things not inherently bad or dangerous may be made so through abuse. In foreign trade we have the anomalous situation of a government urging the formation of trading groups, and at the same time so hampering their actions that they can hardly function.

One of these days we are going to be badly in need of coal, of business information, of foreign trade; and there will be an awakening as to the reasons for their absence. Then perhaps we shall take time to find out what is wrong with some of our laws and fix them up. Let us hope that it will not be too late.

Standards and Tolerances

ONE of the essentials in all standardization work is the adoption and use of standard tolerances as well as dimensions. The lack of this was the chief defect in the adoption of the Sellers or Franklin Institute or U. S. S. thread. But the oversight was perfectly natural and excusable as the use of definite tolerances had not been recognized at that time.

A very common difficulty along this line is to be seen in wrench fits on bolt heads at the present time. We have standard bolt heads and wrenches made in conformity with this standard. But it too frequently happens that the tolerance on the wrench is minus and on the bolt head or nut is plus, and the result is far from satisfactory.

There is, fortunately, a committee at work on the standardization of bolts, nuts and wrenches, which is, of course, working with the question of tolerances in view. The multiplicity of sizes now found on toolposts and other parts requiring adjustment, together with the lack of standard tolerances, makes the number of necessary wrenches altogether too great. This frequently results in a resort to the time honored screw or monkey wrench with the usual damage to the nuts or bolt heads.

The standardization of bolt heads should appeal to every builder of machine tools as well as to users. Such standardization will eliminate some sizes now used, will reduce the number of wrenches to be furnished with each machine and will make it easier to keep the machine in proper adjustment.

Standardization is in the air. Let us all work for rational standards for such parts as do not hamper future development of design.

Shop Equipment News

Hartness Comparator for Gaging Gears

The Jones & Lamson Machine Co., Springfield, Vt., has recently developed an attachment for use on its Hartness comparator when gaging gears. In order to permit the operator of the projecting lantern to have the projected and magnified image shown on a screen within his reach, a mirror is employed at some distance from the lantern so as to throw the image on the back of a ground-glass screen. The arrangement is shown in Fig. 1. The mirror is made especially for the purpose and has a deposit of silver on its front surface, in order to provide the highest degree of reflection. The arrangement is stated to give great accuracy, so that at a magnification of 100 diameters differences of 0.0001 in. can be detected.

With the set-up shown, parts having sharp outlines without burrs can be thrown clearly on the ground-glass screen. However, it is the usual practice to round or chamfer the ends of gear teeth, so that it is not possible to focus clearly on the edges of the tooth and thus obtain a sharp outline on the screen. To overcome this trouble, the instrument is focused at some point along the face of the tooth rather than on the very end of it. The gear is tilted very slightly, so that the light rays strike the side of the tooth.

Since the microscope has a very thin focal plane, it can be focused to show clearly points in one plane and to leave other outlines blurred. If a needle is placed in the plane to be explored, it gives a very sharp projected point and shows the outline of the tooth. This outline lies in the image on the screen between the point of the needle itself and the reflection of it in the face of the tooth. In order to obtain this reflection, it is not necessary to polish the tooth face more than ordinarily done.

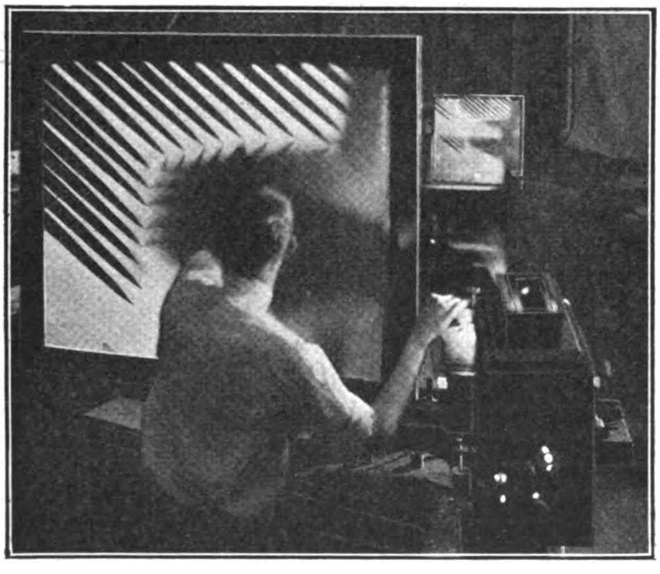


FIG. 1. HARTNESS COMPARATOR FOR GAGING GEARS

The method of mounting the gear and the needles in order to give the contour of the tooth is shown in Fig. 2. The effect produced on the image projected on the screen has already been noted in the previous figure. With this set-up, the comparator can be employed to show tooth shape very accurately. It should be noted that it is possible for several men to work simultaneously around the ground-glass screen without interfering with the image on it.

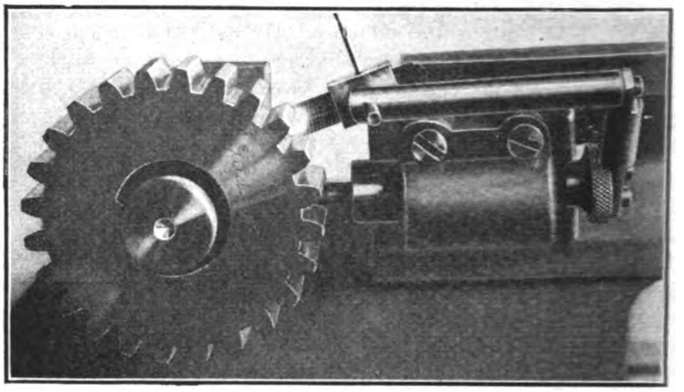


FIG. 2. ARRANGEMENT OF WORK AND NEEDLES ON COMPARATOR

McCollum Electric Hoist

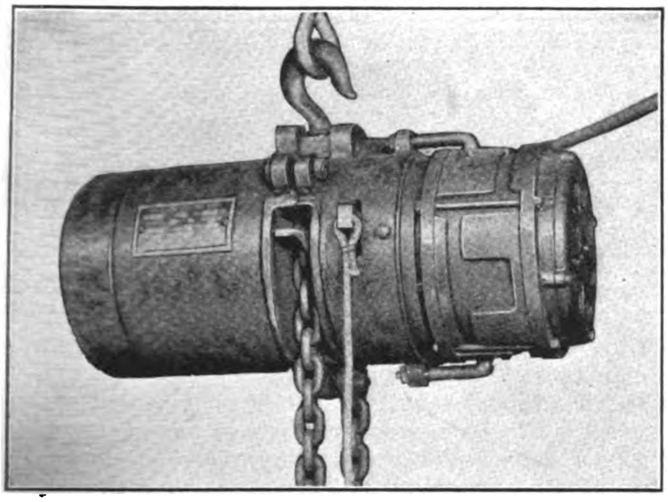
The Joslyn Manufacturing and Supply Co., 3.700 South Morgan St., Chicago, Ill., has placed on the market the McCollum electric hoist shown in the accompanying illustration. The speed-reducing gearing consists of three internal ring gears, three planetary pinions, and a high-speed pinion that is mounted on the motor shaft. The three internal gears are of the same diameter. The outer ones are housed in the frame so that they do not rotate; the middle gear has one more tooth than the outer gears, and is keyed to the chain sheave.

The planetary pinions have long faces, so that they mesh with all three internal gears. The driving pinion is in the center. A reduction of speed of from 100:1 to 350:1 is obtainable between the driving pinion and the sheave which carries the load. A great amount of bulk and weight is eliminated by the ability to use a high-speed motor, due to the large speed reduction.

The use of brakes is eliminated, since the action of the mechanism is not reversible. The speed-reducing gearing can be operated from the motor end only, and no load can be applied at the sheave that will cause the gears to rotate and thus lower the load.

The chain sheave is carried on roller bearings. The only strain on the motor shaft is that of the driving torque. A ball-bearing motor is used, and it can be tipped or turned in any position without spilling the oil. Either alternating- or direct-current motors using from 110 to 440 volts can be employed.

All gears are of machine cut, heat-treated steel, with



McCOLLUM CHAIN-LIFT ELECTRIC HOIST

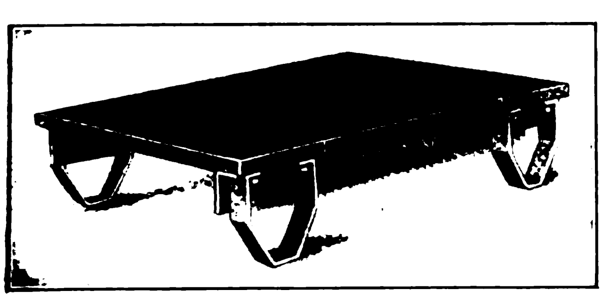
the exception of those used in the smallest hoist, which are of cast iron. The hoist is supplied with either rope or chain lift, although the latter is recommended because of safety and durability. With the chain hoists, a hook can be used on either end of the chain; and for certain classes of elevating work, one load can be unloaded at the top while another is being loaded at the bottom. Only a small amount of head room is necessary for the hoist.

Cowan Steel-Frame Lift-Truck Skid

A steel-frame platform or skid for use with hand-operated lift trucks has recently been placed on the market by the Cowan Truck Co., 7 Water St., Holyoke, Mass. The frame of the skid consists of two 2½ x 2 x 3/16-in. angle irons. Pine planking is secured to the angles by four countersunk bolts, two at each end of each plank.

The shoes or feet on which the skid rests are of malleable iron 1½ in. wide and ¼ in. thick, their shape being shown in the accompanying illustration. They are secured to both the top and the sides of the angle-iron frames, so as to prevent shaking of the platform. The feet are sufficiently rigid to prevent bending under the load, so that the platform retains the proper height. It should be noted that the feet are fastened at the very ends of the platform, so as to give it stability, and also to provide the greatest road clearance when the truck is approaching or leaving a grade. The durability and rigidity of the skid is particularly emphasized.

The skids are made in eight lengths from 24 to 80 in., and in nine widths from 24 to 48 in. All sizes can be furnished in heights of 6½, 7½ and 9½ in., and the larger sizes in 11½ in. height. Special sizes and forms of skid can be furnished to suit special requirements.

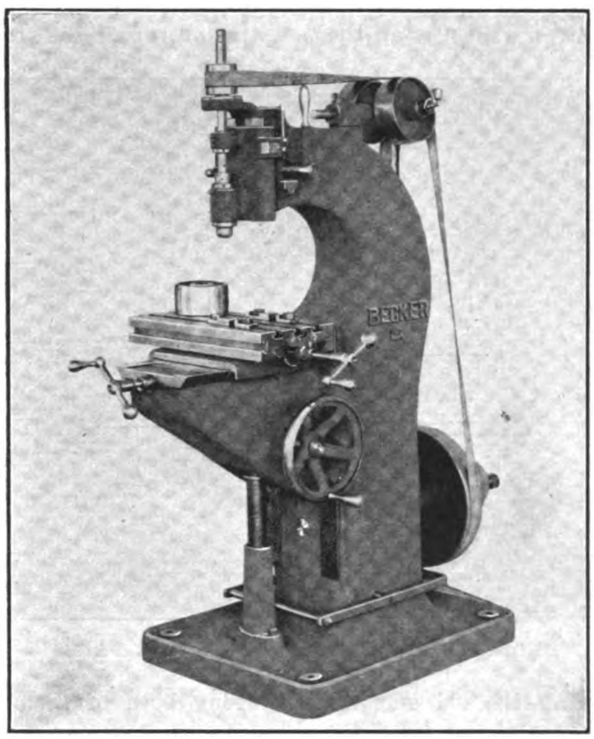


COWAN STEEL-FRAME LIFT TRUCK SKID

Becker No. 2 High-Speed Vertical Milling Machine

The Becker Milling Machine Co., 677 Cambridge St., Worcester, Mass., has recently made some changes in its No. 2 vertical milling and routing machine, in order to fit the machine for high-speed work. The principal change consists in equipping the machine with an auxiliary ball bearing to take the belt pull, so that the machine can be run at speeds at least 50 per cent in excess of those employed on the standard machine. The main bearing of the spindle is bronze with a babbitt lining. The thrust washers on the spindle are hardened steel.

The spindle itself is made of machine steel, and the collars and nuts that it carries are balanced. Two sizes of pulleys are provided for the spindle, a 3-in. pulley being supplied for obtaining high speed, in addition to the 5-in. pulley ordinarily used. To change pulleys, it is only necessary to lift one pulley from the sleeve on which it rests, and substitute the other pulley. The belt slack is taken up by means of the adjustable



BECKER NO. 2 HIGH-SPEED MILLING MACHINE

idler-pulley bracket. The high speed is found particularly useful for manufacturing stamps and stencils.

It is stated that the machine has been successfully run at speeds above 6,000 r.p.m., largely because the proper oiling facilities are provided to care for the high speed. When the maximum speed is 6,000 r.p.m. the other speeds obtainable with the 3-in. pulley are 3,240 and 1,800 r.p.m., and with the 5-in. pulley, 3,540, 1,920 and 1,060 r.p.m. The countershaft speed for such operation is 540 r.p.m. A canvas belt is employed for the high speeds. When lower speeds and larger cutters are employed, a leather belt may be used.

Another improvement in the machine is the use of a full box-form knee, which gives great rigidity. A steel chip guard is provided in the knee in front of the carriage, in order to protect the crossfeed screw.

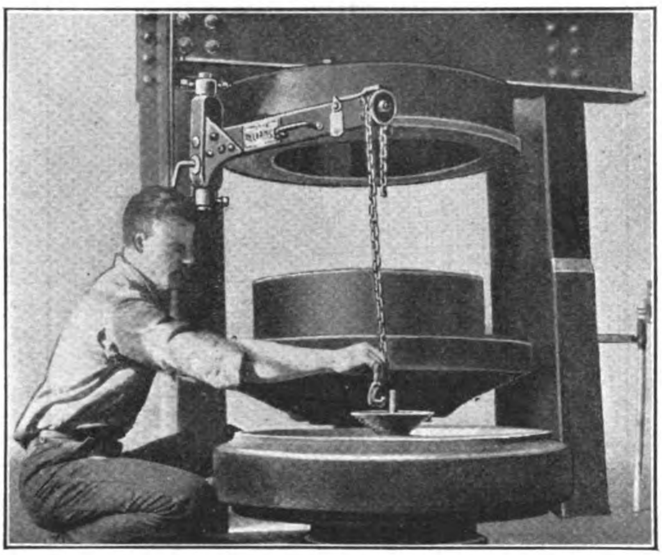
Reliance Wheel Hoist for Tire Press

A hoist intended for use on a press to lift automobile truck wheels into place when changing tires has recently been brought out by the Reliance Trailer and Truck Co., Inc., 1642 Howard St., San Francisco, Cal. The device is known as the pressman's helper, as it enables one man to operate the press. The illustration shows the operator attaching the hook to the wheel.

Two clamps are secured to the upright frame of the press. The clamps carry brackets in which the trunnions of the swinging arm are fastened. Since the brackets are adjustable on the clamps, it is possible to position the device so that the center line of the chain will cross the center line of the press platen.

Hoisting is accomplished by hand, through a gear reduction connected to the crank at the pivoted end of the device. Turning the crank operates the small chain pulley at the outer end of the arm, so that the chain and load are lifted. When not in use, the arm can be swung back clear of the opening in the press.

The wheels are secured by means of cones placed in the hubs. When the upper cone is placed on the shaft of the lower cone, the wheel is prevented from slipping sideways. By placing the new tire on top of the wheel carrying the old one, and swinging both of them in the press at one time, the old tire can be removed and the new one applied in one operation. Centering and positioning the tire before lifting the wheel into the press is easily done.

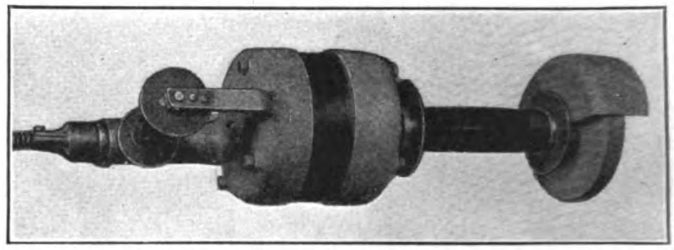


RELIANCE HOIST FOR TRUCK TIRE PRESS

The device saves time and labor on the part of the operator and greatly lessens the chance of injury in handling the wheels. Besides being used on a tire press, the hoist is adaptable to general work around the shop. Different brackets can be furnished for securing it. Its lifting capacity is 1,200 pounds.

Forbes & Myers Model 35 Portable Electric Grinder

The portable electric grinder illustrated herewith has recently been brought out by Forbes & Myers, 172 Union St., Worcester, Mass., and is designated as the Model 35. The device is of the squirrel-cage induction type and has fire-proof windings. The insulation is asbestos that has been given a special treatment to bind the fibers into a tough, flexible mass capable of withstanding a red heat indefinitely.



FORBES & MYERS MODEL 35 PORTABLE GRINDER

The motor has $\frac{3}{4}$ hp. It maintains its speed under load better than the universal type of motor. It very quickly regains speed after slowing down due to heavy load. The normal speed is 3,600 r.p.m., and the wheel ordinarily carried is 6 x 1 in. in size. The bearings are self-lubricating and of the metal-graphite type.

In order to prevent the possibility of the operator receiving an electric shock from the tool while handling it when standing on a damp floor or when making contact with metal, a grounded wire is employed. This wire adds but little weight to the cable, and can be attached to a water pipe or some permanent ground while the tool is in use. The wheel is equipped with a guard, and convenient grips are provided for the operator. The switch is within easy reach in the handle.

Gammons-Holman "Parob" Expansion Reamer

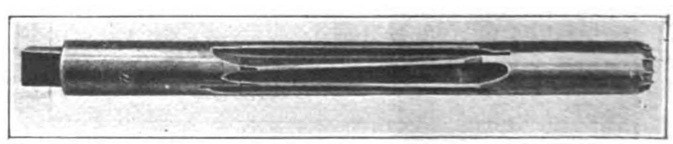
The Gammons-Holman Co., Manchester, Conn., is introducing a form of expansion hand reamer, known as the "Parob" because of the fact that the cutting edges are alternately parallel and oblique.

The reamer is of the type that is expanded from the center by means of a tapered plug, adjusted by a screw in the end. The end of the pilot is recessed to a considerable depth for the double purpose of protecting the head of the screw, and to allow the reamer to be placed upon centers for regrinding. A hole of generous size in the squared end admits oil to the central cavity, from which it may flow through the slots to the cutting edges.

The advantage claimed for the peculiar disposition of the cutting edges is that as each parallel blade is followed by one obliquely disposed, chatter is eliminated. It is also claimed that the blades are more easily honed, without danger of rounding over the cutting edge, than is the case with helical fluted reamers.

A feature of the reamer is the placing of cutting edges upon the extreme end of the pilot portion for the purpose of removing burrs and permitting the reamer to enter the hole easily. This feature is called the "burr cutter."

The reamers are made in one piece, with blades cut from solid stock, and receive a special heat-treatment designed to insure long life and retention of keen cutting edges. They are made in standard sizes from $\frac{1}{2}$ in. to $1\frac{1}{2}$ inches.



"PAROB" ONE-PIECE EXPANSION REAMER

Ramsdell Hand Vise-Lathe

The Campbell Manufacturing Co., Slater Bldg., Worcester, Mass., has recently placed on the market a device known as the Ramsdell hand vise-lathe. The tool is intended to enable accurate cutting from bar stock without the use of a lathe or screw machine such work as screws, studs and pins. With it wire springs can be wound to any desired pitch. The tool is made

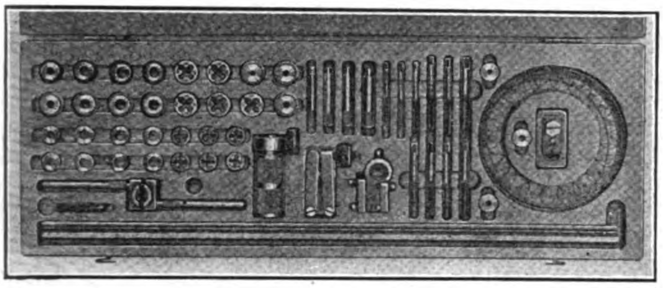


FIG. 1. RAMSDELL HAND VISE-LATHE SET

especially for garage men, automobile owners, farmers and those who have occasion to repair machinery without having machine tools available.

In Fig. 1 the tool is shown packed in a box with the necessary taps, dies, bushings, cutting tool and spacers, all readily accessible. Any combination of bushings, dies and taps in U. S. S. or S. A. E. standard threads can be furnished. By means of the dies and wrench, bars can be threaded in the ordinary manner. For turning, however, the set-up shown in Fig. 2 is employed. It is necessary to have in addition to the tool only a vise in which to hold the stock.

Bar stock up to and including 1 in. in diameter can be handled, thus enabling the operator to make hexagon-head capscrews up to $\frac{5}{8}$ in. in size, square, fillister and round-head capscrews up to $\frac{3}{4}$ in., flathead capscrews up to $\frac{9}{16}$ in. and button-head screws up to $\frac{5}{8}$ in. Each set is furnished with centering bushings from $\frac{1}{4}$ to 1 in., by $\frac{1}{16}$-in. steps. Any required length of screw, stud or spring can be made.

The combined die and toolholder is shown with a cutting tool in position and removing a chip from the work. Hand feed is provided, so that the operator may

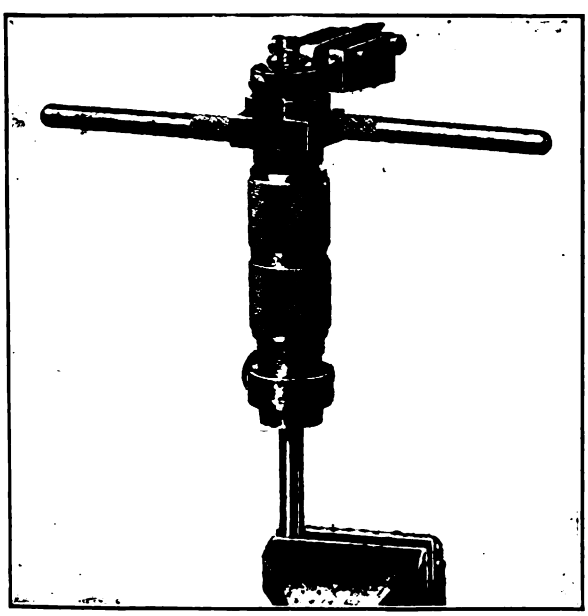


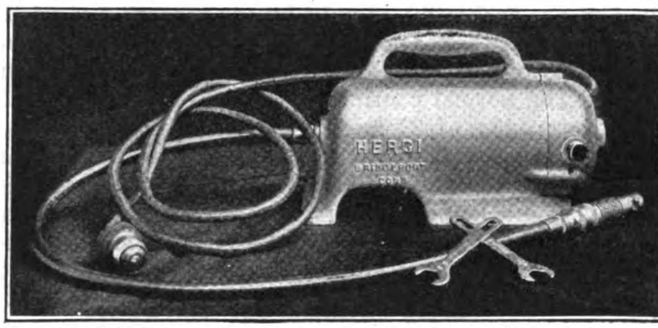
FIG. 2. TURNING WITH HAND LATHE

take either a light or heavy chip. The required size of die can be fitted in the upper portion of the holder, and a centering bushing secured in the lower portion. Since the stock must first pass through the centering bushing, the thread cannot be cut off center. The arrangement also prevents screws and studs from being turned eccentrically. A knurling attachment is provided in the equipment. All wearing parts of the device are casehardened.

Hergi H-250 Flexible-Shaft Outfit

The illustration shows a motor-driven flexible-shaft outfit recently placed on the market by the Hergi Manufacturing Co., 250 Fifth St., Bridgeport, Conn. A high-speed motor, of $\frac{1}{8}$ hp. and capable of operation on 110-volt alternating or direct current, is inclosed in an aluminum casing having a base and handle integral with it. It is thus possible to easily pick up the entire unit and carry it to the work.

A ventilating fan is provided to keep a current of air passing between the field and the armature windings. Since the air current also passes between the spokes of the front bearing and through a series of



HERGI H-250 FLEXIBLE-SHAFT OUTFIT

holes around the bearing in the end cap, both bearings are cooled.

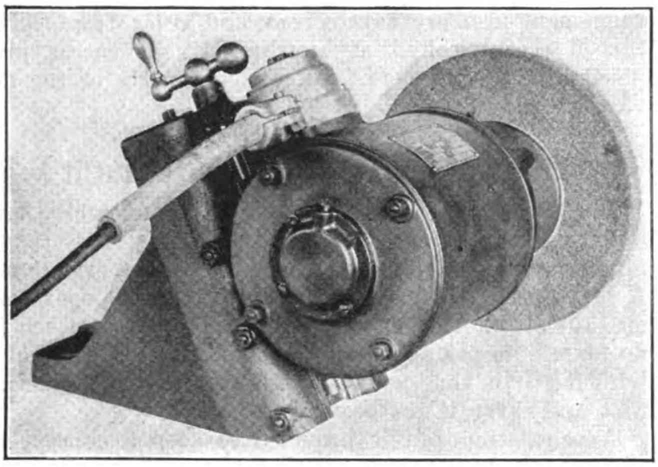
The shaft is $\frac{1}{4}$ in. in diameter, 3 ft. long and wound with wire. The sheath is metal inside and is covered with whipcord. A ball-bearing handpiece with a $\frac{3}{16}$-in. chuck is provided. The No. 4 or 5 shaft, sheath and handpiece are interchangeable on the motor unit.

Six feet of drop cord with an attachment plug are provided with each motor. Since the cord is fastened inside the end plate, no external binding post is necessary. The unit is simple and has but few parts; and it is known as the Type H-250 or 1922 model. It is adaptable to the all work ordinarily handled by flexible-shaft equipment.

Van Dorn Angle-Plate Grinding Attachment

The Van Dorn Electric Tool Co., Cleveland, Ohio, has just placed on the market the 12-in., motor-driven, angle-plate grinding attachment that is shown in the accompanying illustration. The principal feature is the inclined slide, which permits of movement in one plane for both feed and adjustment of the height of the spindle. The effect of both horizontal and vertical slides is thus obtained, with the simplicity and rigidity of a single slide. The rigidity of the machine is greater than that of the type with a vertical slide, as the machine can stand firmly on its base without fastenings.

The shaft is $1\frac{7}{16}$ in. in diameter through the motor and 1 in. through the wheel. The heavy-duty ball bearings are mounted in dust-proof housings and are grease lubricated. Motors for alternating or direct



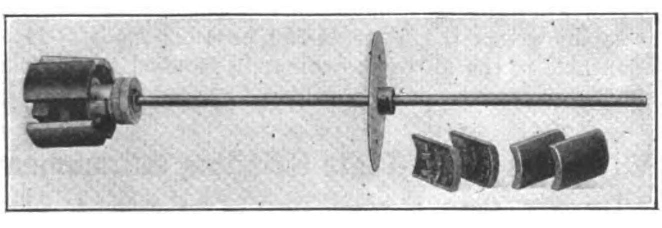
VAN DORN ANGLE-PLATE GRINDING ATTACHMENT

current are interchangeable in the same housing. These motors are designed and built by the concern for grinding service; they are tested and rated to meet the standards of the A. I. E. E. and the Electrical Power Club. The normal continuous capacity is $1\frac{1}{3}$ hp., with a peak capacity of $2\frac{1}{4}$ hp. The speed is 1,800 r.p.m.

It is stated that under test a roll 7 in. in diameter was ground in a large lathe at a speed of 60 ft. per minute and a longitudinal feed of the carriage of $\frac{1}{8}$ in. per revolution, a cut 0.002 in. deep being taken continuously. The net weight of the attachment is 175 pounds.

Stimson Internal Lapping Tool

In the accompanying illustration is shown a device for lapping the bores of automotive cylinders. The tool has recently been placed on the market by the Stimson Engineering Co., 598 Sixty-Eighth Ave., Milwaukee, Wis. It will be noted that shoes which make contact with the cylinder bore are held by flexible connections at one end of a shaft. The shoes can be easily removed; two sets are provided, one to fit bores $2\frac{3}{4}$ to $3\frac{1}{2}$ in. in diameter, and the other for bores from $3\frac{1}{2}$ to $4\frac{1}{4}$ in. In order to fit the shoes to the size of the



STIMSON INTERNAL LAPPING TOOL

cylinder, a nut operating the taper adjustment is provided. A locknut clamps the adjusting nut, so that the tool can be held at any particular size.

The disk mounted on the shaft is adjustable in position, so that it acts as a stop and prevents the tool from feeding too deeply into the cylinder. The tool is ordinarily operated by an electric- or air-driven portable drill, or by a drilling machine, although it can be attached to the tailstock of a lathe.

It is not necessary to remove the cylinder block from the chassis of the automobile, in order to finish the bore. The tool requires no lining up with the cylinder, as the shoes can swing to adjust themselves to the work. It cuts the carbon and roughness from the surface of the cylinder, a grinding compound being employed to facilitate this action. The bore can be finished both round and straight. Points where the diameter is smaller can be felt by the resistance offered to the tool when feeding it through the bore, and they can be given special attention. The tool is expanded as the work progresses.

The tool may be employed without the shoes for holding pistons when filing them to size. The shaft is held in bearings and rotated by means of a portable drill, or it can be secured in a lathe chuck and supported by a steady rest. Thus a new piston can be finished to the size necessary to fit the reground cylinder.

How Shall We Designate Tolerances?

By Frank C. Hudson

The problem of designating tolerances has several angles. There is no question as to the advisability of unilateral tolerences, so far as basic dimensions are concerned, but a very practical engineer of my acquaintance brings up some interesting points as to the best way of showing tolerances.

He believes in the one-way or unilateral tolerance but not in the unilateral designation of it. Suppose the basic dimension for a hole in a bushing is 1.790 in., with a permissible maximum of 1.792. The usual method of dimensioning the drawing would be $1.790^{-0.000}_{+0.002}$ or 1.790 in. + 0.002. The shaft dimension would perhaps allow for a minimum of 0.002 clearance and would read $1.788^{+0.000}_{-0.002}$ or 1.788 — 0.002, giving a maximum of 0.004 in. clearance.

His experience shows that as men endeavor to work to the dimension they see plainly, at the same time playing safe on the tolerance side, there will be a tendency to get maximum clearance instead of a medium between the two. His preference is for dimensions as follows: 1.791 ± 0.001 and 1.787 ± 0.001. He believes that while this gives a maximum possible clearance of 0.005 in. you will get much nearer an average of 0.003 in. than in the other case.

Other ways of designating tolerances also have advocates. One way is to give both maximum and minimum dimensions such as $\frac{1.792}{1.790}$ or $\frac{1.788}{1.786}$.

Another way which is unusual, but which has its good points, is to give the basic dimensions as 1.790 and use two minus tolerances for the shaft and two plus tolerances for the hole. This gives $1.790^{-0.001}_{-0.003}$ for the shaft and $1.790^{+0.001}_{+0.003}$ for the hole. This shows clearly that the basic dimension is 1.790 and that the shaft size can vary between 7.789 and 1.787. The hole can vary from 1.791 to 1.793 with no clearance less than 0.002 permissible.

Pet systems have no place in this question. We want a method which will show the workman just what is wanted with the least chance for confusion and error. This is a vital part of standardization and standard tolerances and should be carefully considered by all those interested in shop and drafting room practice, in order to promote accuracy, speed and uniformity.

News Section

Government Revives Patent Convention with Germany

After an extended study of all the ramifications of the proposal that the Patent Convention of 1909 with Germany be allowed to lapse, the State Department decided to revive the convention, and notice to that effect was transmitted to the German authorities prior to May 11, which was the time limit for such notification. The revival of this convention gives the holders of American patents, registered in Germany, immunity from the working clause in the German patent law. Strong pressure was brought by the War Department and the chemical industry against the revival of the convention. The War Department is anxious to secure the enactment of a working clause to apply to all patents registered in the United States. The American chemical industry has comparatively few patents registered abroad. On the other hand Germany has a large number of patents registered in this country which are not being worked. The effect is to preclude the development in this country of numerous branches of chemical manufacturing.

Manufacturers of machinery in the United States were among those who were most strongly in favor of reinstating the convention with Germany. It was stated that it would cost machinery manufacturers millions of dollars to undertake the manufacture of their patents in Germany. The electrical industry also would have been affected adversely had the convention not been continued.

Nominations for A. S. M. E. Officers Announced

The nominating committee of the American Society of Mechanical Engineers, headed by W. W. Varney, of Baltimore, has made its report to the society on the choice of candidates for officers in the association.

The committee offers the following names: For president, John Lyle Harrington, of Harrington, Howard & Ash, Kansas City, Mo.; for vice-presidents: W. S. Finlay, Jr., American Water Works and Electric Co., New York, W. H. Kenerson, Brown University, Providence, R. I., Earl F. Scott, Earl F. Scott & Co., Atlanta, Ga., and H. H. Vaughan, Montreal, Quebec, Canada (to fill unexpired term of L. E. Strothman). For managers: A. G. Christie, Johns Hopkins University, Baltimore, Md.; James H. Herron, James H. Herron Co., Cleveland, Ohio; Roy V. Wright, Simmons-Boardman Publishing Co., New York. For treasurer: William H. Wiley, John Wiley & Sons, New York.

For delegates to American Engineering Council: John Lyle Harrington, L. P. Alford, A. M. Greene, Jr., Fred J. Miller, Max Toltz, Fred R. Low, S. W. Stratton, Edward R. Fish and Edwin B. Katte.

Industries of Southeast Show Improvement Over 1921

A steadily increasing demand for iron and steel products during the past two months, with every indication that business will continue to grow more healthy during the remainder of the year, has served to materially brighten the iron and steel outlook in the Southeastern territory, and especially in the Alabama and Birmingham district.

During the past five or six weeks this demand has brought about the resumption of operations at a number of furnaces in the Birmingham district that have been closed for several months, some of them for more than a year. Others in the district are preparing to start operations again as soon as business reaches a point that will merit steady activity.

One of the largest industries in the district that is now operating at 100 per cent capacity is the Tennessee Coal, Iron & Railroad Co., in steel production, while the structural mill is on a double turn. The other mills of this company, while not running at 100 per cent of capacity, are in active operation.

Outside of Alabama, iron and steel conditions over the Southeast are noting the general improvement, but not to as great an extent as in the Alabama district. Activities are at a lower ebb in Georgia, North Carolina and Tennessee than in Alabama, but the outlook promises much greater activity before the end of summer.

General business conditions are steadily improving and industrially at least the section is rapidly assuming an era of normal activity.

Because of the depression of last year the manufacturing companies of Georgia were not nearly as prosperous in 1921 as they were in 1920. It is stated that Georgia has a total of 5,123 manufacturing industries. The total capital invested in the industries of Georgia during 1921 was $441,505,757, which was less by $7,000,000 than the previous year.

Machinery Exports Exceed Pre-War Figures Says Dr. Klein

In an address before the U. S. Chamber of Commerce convention in Washington last week Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce of the Department of Commerce, said that exports from the United States of industrial machinery are now 60 per cent above pre-war level, with expanding markets in India, Japan, Dutch East Indies, Brazil, Argentina, and a tendency toward basic improvement in Cuba and Mexico. Reports from some smaller countries also show that conditions of trade are improving and that prospects for further trade are better.

Freight Loadings in April Increase in Volume

Reports just received by the car service division of the American Railway Association show that 758,286 cars were loaded with revenue freight during the week ending April 29, compared with 714,088 during the previous week, or an increase of 44,198. This was the largest number of cars loaded during any one week in April and was an increase of 37,202 over the corresponding week in 1921.

Increases compared with the preceding week were reported in the loading of all commodities. Merchandise and miscellaneous freight, which includes manufactured products, totaled 534,651 cars, an increase of 18,631 over the preceding week and 81,889 in excess of the total for the corresponding week last year.

Coal loadings totaled 75,632 cars, 12,187 more than were loaded during the previous week and the largest number loaded during any one week since the coal strike began. This was, however. 68,228 below the corresponding week last year and 93,086 under the total for the same week in 1920. Coke showed an increase over the week before of 343 cars which brought the total to 7,952 cars. This was 3,175 more than were loaded during the same week last year. Tabulations showed 14,053 cars loaded with ore, an increase within a week of 4,283 cars and an increase of 6,277 over the corresponding week in 1921. During the corresponding week in 1920, however, 28,814 cars were loaded with ore, which is nearly twice as many as this year.

Swope Elected President of General Electric

Following a meeting of the board of directors in the General Electric Co., held in New York on May 16, Gerard Swope, president of the International General Electric Co., was elected president to fill the position vacated by the resignation of E. W. Rice, Jr., who in turn becomes honorary chairman of the board of directors. At the same meeting, C. A. Coffin retired as chairman of the board and was succeeded to that position by Owen D. Young, long associated with the company as vice-president. Anson W. Burchard, for many years the vice-president in charge of public utilities and foreign investment was elected vice-chairman of the board. Additional directors added to the board are J. R. Lovejoy and G. F. Morrison.

Mr. Swope, the new president, is a graduate of the Massachusetts Institute of Technology and received his early technical practice in the shops of the Western Electric Co., at Chicago. He was elected president of the International organization in 1919.

Mr. Coffin will continue as a director and as consulting engineer.

The Trend of Business Improvement—Plants Resuming

The Standard Foundry Co., Anniston, Ala., has resumed production at the local plant of the Lynchburg Foundry Co., and expects to develop capacity operations at once. The other plants of the company are also running at regular output.

The Willys-Overland Co., Toledo, Ohio, is increasing production to a basis of 400 cars a day of Overland and Willys-Knight models. Employment is being given to about 8,000 men, and it is proposed to advance this quota at an early date. A call has been issued for skilled mechanics.

The Maxwell Motor Car Co., Detroit, Mich., is running on a full production basis at its plant, averaging 300 automobiles a day. The company has recently added another 100 men to the force, totaling over 1,000 additional during the last three weeks. Production is being increased at the Dayton, Ohio, plant, and it is planned to place this works on a capacity schedule at an early date, giving employment to about 1,000 men.

The American Locomotive Co., is scheduling a portion of recent orders for production at the Brooks plant, Dunkirk, N. Y., including 50 engines for the Chicago & Northwestern Railroad Co. The working force will be increased at once.

The Anchor Concrete Machinery Co., Adrian, Mich., manufacturer of concrete block and tile-making machinery, has developed maximum output at its new local plant, comprising the former works of the Adrian Steel Castings Co., and has plans under way for immediate expansion, including the erection of a new addition. The plant now operated at Rock Rapids, Iowa, formerly the main factory, will be removed to Adrian.

The New York Central Railroad Co. is arranging for the immediate resumption of operations at its Hobson repair shops, near Middleport, Ohio. Former employees will be engaged on a piecework basis.

The Bessemer & Lake Erie Railroad Co. is planning to resume operations at its Greenville, Pa., shops by the close of May. The works were recently closed down. Employment will be given to about 1,500 men.

The White Motor Co., Cleveland, Ohio, has added about 750 men to the working force during the past few weeks, increasing the quota to 3,000 employees. Motor truck production has been developed to a point of over 800 cars a month.

The Newport News Shipbuilding and Dry Dock Co., Newport News, Va., is arranging for immediate increase in operations, with employment of additional men. The company has received an order from the Chesapeake & Ohio Railroad Co., for 3,000 gondola cars and 1,000 steel cars for general service.

The Farrell Works plant of the Carnegie Steel Co., at Farrell, Pa., has started eight open-hearth furnaces.

The Steel Products Company, Cleveland, Ohio, is adding steadily to its operating staff. About 400 men are being employed. The force at the Detroit plant, local officials assert, is also being increased. February business increased in volume 50 per cent over January. The company is making principally bolts and valves for the automotive trade.

Inquiries for low-priced motor car bodies have increased to a considerable degree in the last few weeks, according to announcement made this week by officials of the Fisher Body Co., Cleveland, Ohio. The plant is operating nearly to capacity, turning out 200 bodies a day. The company plans to put on more men, in order to take care of the business that has come in lately.

Six more hot mills of the American Sheet and Tin Plate Co., at Pittsburgh, Pa., were reopened on March 20.

The Morgan Engineering Co., Alliance, Ohio, has received an order from the Wheeling Steel Corporation, of Wheeling, W. Va., for twenty-two cranes up to 125 tons capacity; also for three shears up to 900 tons capacity. Additional men will be employed at the Morgan plant to take care of this and other orders.

The Nash Engineering Works at South Norwalk, Conn., is reported working on full-time with a normal production force.

Automotive Engineers Meet at White Sulphur Springs

Plans are fast being formulated for the summer meeting at White Sulphur Springs, Va., June 20 to 24, of the Society of Automotive Engineers. Reservations have already totaled over five hundred. Special railroad rates have been secured for members and guests and the certificates will be ready for applicants on June 10. Special trains have been arranged to transport the Eastern and Western contingents to White Sulphur. The Mid-West section will have a special train out of Chicago; the Detroit and Cleveland sections will also have special trains.

The technical program for the meeting is practically completed. The meeting has been divided into five sessions as follows: Research Session; Fuel and Engine Session; Passenger Car Session; Aeronautic Session; and Motor Bus Session. A report from the research department of the society will be presented by Dr. H. C. Dickinson. This report will treat principally of the volatility of motor fuel. Fuel tests will be described by W. S. James of the Bureau of Standards. Several papers will be presented at the Fuel and Engine Session; among them will be a compilation of data on the characteristics of blended fuels by Thomas Midgley, Jr. Speakers at the Passenger Car Session will be H. M. Crane, P. M. Heldt and J. B. Bray. The Aeronautic Session will include papers on several phases of aircraft progress. Two of the papers will be by Capt. G. E. Hallett, of the Air Service, McCook Field, and Prof. E. P. Warner. In the Motor Bus Session papers will be presented by G. A. Green and R. E. Plimpton. The entertainment committee has planned several events of a social and sporting character to offer some diversion from the technical sessions.

Carnegie Tech Students Form Chapter of S. I. E.

A chapter of the Society of Industrial Engineers was recently organized among students at Carnegie Institute of Technology, Pittsburgh, to be known as the Carnegie Industrial Engineers Society.

The department of machine construction, under Prof. Charles C. Leeds, organized the chapter, which includes 108 members. Prof. Joseph W. Roe, president of the Society of Industrial Engineers, was present at the initiation and spoke to the members. Dr. A. A. Hamerschlag, president of Carnegie Tech, also gave an address and was made honorary chairman.

The officers are: President, R. W. Marshall, of Pittsburgh; vice-president, J. V. Foster, of Latrobe, Pa.; secretary, J. K. Matter, of Harrisburg, Pa.; treasurer, B. N. Greenlaw, of Ridgewood, N. J.

Engineers To Continue Campaign for Public Works Department

Warning that President Harding is encountering opposition so strong that his efforts at government reorganization may be defeated, the American Engineering Council of the Federated American Engineering Societies has announced that the engineers of the nation will start afresh a nation-wide movement for the establishment of a National Department of Public Works.

In a statement saying that the public works question would come up at a meeting of the executive board of the council in Pittsburgh, May 26 and 27, it was asserted that government reorganization is being blocked by "the petty jeolousies and conceits of men in high official position."

L. W. Wallace, of Washington, executive secretary of the Federated American Engineering Societies, through whom the statement was issued, said that Dean Mortimer E. Cooley of the University of Michigan and president of the council, recently visited President Harding, to whom he tendered the support of the organized engineers of the nation in matters affecting engineering and allied service.

One part of the statement reads as follows:

"Men in high official positions, accustomed to the handling of large affairs prior to the beginning of their official life, and whom one would naturally suppose must be above the petty jealousies and conceits of the average man are now exhibiting jealousies and animosities that one might expect to come from a group of children quarreling over the distribution of sweetmeats. Various organizations of high repute, led by men of high character, are supporting these absurdities with an intensity almost unbelievable.

"The country needs right now the voices of those who look and think beyond the outer skin. We always have with us the voice of the crowd, too often impelled by unwise leadership and mob psychology. Every little while it is incumbent upon the thinking portion of our citizenship to render public service."

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

While the speculators in securities are merrily buying stocks and bonds that can be instantly resold if the tide should turn, the merchants and manufacturers of the country are still considering the policy that they ought to follow in preparing for the autumn trade that should normally follow the harvest season.

This problem is a difficult one, for the articles that compose a retailer's or a jobber's stock cannot be resold like stock exchange securities and an error in calculating the prospective demand often means a ruinous inventory loss. Similarly a manufacturer runs great risks when he puts his capital into the production of goods that are not sold before they are made, but these are risks that many are taking today.

Buyers Are Cautious

It is undeniable that the advance in most basic raw materials far exceeds that which is obtainable for their manufactured equivalent from consumers, and the intermediary distributor, remembering the experience of two years ago, is wondering whether another "buyers strike" might not follow an effort to equalize retail prices with production costs.

It is generally believed that stocks are small and shelves bare. This belief is confirmed by the relatively small amount of first-class commercial paper offering and the question that nearly every merchant is now asking himself is "shall I buy or wait?" Cotton, for instance, is well over 20 cents a pound, but the trade in cotton goods, though better than it was, does not fully reflect the advance in the raw material. The same thing is true of wool and woolen goods, hides, leather and shoes, silk and silk fabrics, hogs and hog products, wood pulp and paper.

The disparity between retail prices and the cost of production is of course appreciably increased by high freights, high wages and heavy taxes, and although it is hoped that at the dinner he gave them President Harding may have persuaded the railway executives to slightly reduce the cost of transportation, there are few who expect any reduction in wages or taxes. This being the case it is plain that unless the price of agricultural products can be lowered there is not much chance of a further decrease in the cost of living.

Those who believe that the farmer can be forced to accept substantially less than he is now getting for the fruits of his toil disregard his newly acquired political power and self-consciousness. I cannot expect any substantial decline in farm products and am therefore impelled to conclude that the trend of retail prices will be upward during the balance of this calendar year and until the crops that mature in 1923 are far enough advanced to have an influence upon the markets.

This is a rather long distance view to take of a profoundly important question, but after studying it from every angle I cannot reach any other conclusion. We have in the first place an abundance of credit. The ease of money is rapidly thawing out and liquifying the frozen loans of which we had heard so much. The enormous bond sales of the past six months have made it possible for many corporations to buy the new equipment of which they are in need. Its fabrication will provide employment for those formerly unemployed. A scarcity of labor is in fact already reported from some points in the Middle West. An increase in the consumptive demand will be the result and when this occurs an advance of four or five cents a yard in the cost of cotton cloth or four or five dollars in the cost of a suit of clothes will not deter those who have the money with which to satisfy a long felt want.

There may be some reason to doubt whether further advances in some agricultural products can be maintained, but with cotton at twenty cents, wheat at $1.25 and corn at over 50 cents on the farms the position of the farmer is greatly improved and he will be able to buy much that he was compelled to deny himself a year ago.

The idleness and loss caused by the textile strike in New England and the coal strike are not disregarded in this prognosis, but the cotton operatives are gradually returning to work and there is good reason to hope that after President Harding has finished with the steel men and the railroad officials he and Mr. Hoover will turn their attention to the coal industry and find a way to start it going again.

A Loan to Germany

The Genoa Conference has been a fizzle, it is true, and no one expects much of the gathering that is to be held in June at the Hague, but sterling exchange reached a new high record last week and America regards this as more important and significant than a trade agreement with Russia, which country, as Mr. Hoover points out, took only one per cent of our pre-war exports. It is, however, reported from Berlin that Mr. Morgan will head an international syndicate that will lend Germany 5,000,000,000 gold marks, equal to $1,250,000,000. If this should be true the effect in England and France would be electrical, but the resulting deflation in Germany might be depressing and would put an end to the abnormally cheap production which now enables German manufacturers to undersell the rest of the world.

All this would of course be to America's advantage and the effect would be to inflame speculation here, particularly on the Stock Exchange, where an appreciation of the possibilities was expressed by great activity last week.

The bond issues were, however, less numerous, and in accordance with precedent more attention is now being given to stocks. The consolidations, effected and rumored, in the steel industry have been used to advance the stocks of the corporations involved and others indirectly affected, but there is still a fear that the Department of Justice may thwart one or more of the proposed combines. This fear would seem to be unwarranted for the present Administration is not opposed to big business and the reports of President Harding's dinner to the steel men last Thursday evening indicate that its purpose was an abolition of the 12 hour day in the mills rather than an interference with the proposed combinations.

Large Industries Busy

In the steel industry itself there is a constant and noticeable increase of activity. Many mills are now working up to capacity and the average is put at 70 per cent of maximum. Prices for both iron and steel are higher and copper is up to 13½ cents. The automobile industry is also booming and it is asserted that the May production of passenger cars will be the largest on record. This means an increased demand for tires later on. It ought to have its effect on rubber, which still hangs around 16 to 16½ cents for the standard grades.

The railroad earnings for April thus far reported are encouraging, but the buying of railway stocks was checked by the thought that the President may demand more of a reduction in rates than the roads can afford at present. If this apprehension proves to be unfounded higher prices for many railway securities will probably be recorded as the various combinations talked of take more definite shape. The weekly statement of the Federal Reserve System shows no important changes. The reserve ratio is 77.6 per cent as compared with 77.3 a week ago.

In America nearly all the indicia of business indicate greater activity. The chain stores report a large increase in sales and the mail order houses are now running ahead of last year. Bank clearings tell the same story.

The figures of our foreign trade for April show a decrease in both exports and imports, which is not surprising, but the excess of exports over imports was $104,000,000 as compared with $86,000,000 a year ago, which is better than was expected.

The trade reviews are generally cheerful and everywhere on this side of the Atlantic the barometer appears to be rising. It may, of course, go so high that a further rise would be impossible. Then it will be well to shorten sail, but for the present this seems unnecessary provided the commercial mariner does not relax his vigilance in scanning the horizon for signs of a change in the weather.

Germany's Labor Problem

Cheap Labor the Basic Factor in Present Economic Condition—Relation of Wages to Depreciation of Currency—Labor Legislation in the Factories

BY OUR BERLIN CORRESPONDENT

Germany represents to-day, as far as business is concerned, an oasis within a vast desert. Situated in the midst of countries which are all more or less suffering under a prolonged and extensive business depression, Germany affords a contrast which perhaps was never more striking than now, when the intensity of production has reached its utmost limit. The reason for this remarkable condition is well known, and there is probably no one in the country who deludes himself into the belief that the excellence of Germany's products has procured for her the exceptional position she enjoys among other nations.

The truth is that Germany presents to her own inhabitants and to the rest of the world a huge warehouse where sales can, or are supposed to, be had at bargain prices. As almost everyone in the world is concerned in the question why such a state of affairs exists, and how long it can be maintained, Germany's economic conditions have become the subject of the closest scrutiny of all sides. When a foreigner comes to the country, one of the first questions he asks is, "How can Germans sell their products so much cheaper than other nations?" The reply he invariably receives can be condensed into the one word "valuta"; meaning the exchange, an all powerful word which is supposed to solve every puzzle that may present itself to the foreign mind, expressing all that there is to be said.

The discerning mind can, however, receive no satisfaction from such reply. The problem is much more complicated, and cannot be explained in a few catch words. It is not controlled by one economic function, but by a number of them. Their relations to each other and the sequence of actions and reactions they produce have never before been experienced in the history of mankind, which makes the situation hard to be understood by outsiders as well as by Germans themselves. The understanding is in no way facilitated by the fact that part of those economic functions are a product of natural development, and others are caused by deliberate manipulation. It can be said that even those most concerned, Germany's economic and political leaders, are not free from the confusion thus created. If they were, they would have succeeded in keeping the current of developments under control. The part that the administration plays is confined to producing some bends and twists in one place or straightening out some in other places, as seems advisable in the interests of the country.

OFF HER EQUILIBRIUM

Germany represents to-day a territorial unit in which the economic atmosphere, if this figure of speech is permitted, is out of equilibrium with that of countries living under normal or nearly normal conditions. It may be compared to a vessel from which the greater part of its substance has been ejected, causing a partial vacuum. The suction thus created is the force which constitutes Germany's chief motive power. As this vessel is not a self-contained unit but subject to intercommunication with its surroundings, diffusion of course takes place through its walls, varying according to the difference between the inside and outside pressure, with the tendency to restore the equilibrium. In this simile, pressure is synonymous with prices. Granted free inter-communication, prices in Germany would adjust themselves automatically to those of other countries. The exchange has in truth nothing to do with the level of prices. It can change only figures, but not the value they represent. The explanation of the problem, which the low prices in Germany represent, is to be found on the one hand in the fact that the effects of the diffusion have always been counterbalanced, and more than that, by further evacuation, and that on the other hand the process of the diffusion is by a most elaborate and intricate economical system been retarded considerably.

GOVERNMENT AT FAULT

During the war and almost two years after its end, this system consisted chiefly of enforcement of maximum prices on all commodities of every-day life. Since their abolishment the control has become much more difficult and also more intricate, hardly being recognizable from outside. Even such close and painstaking students of Germany's economic life as the foreign commissions of control residing in Germany are attributing the low level of prices in Germany to the government's maniplation of the price of grain, and to the low price of coal and transportation. The first is comparatively so insignificant that its influence on the general level of prices is almost nil. The cost of coal and transportation, on the other hand. is not an absolute quantity but a function of a factor which in truth is the basic factor in the whole problem—the cost of labor.

The question to be asked, and which indeed is asked incessantly without finding a suitable reply, is how in so nearly a socialized state as Germany is, the cost of labor can be kept down so far below the pre-war standard. At present a skilled workman receives on the average 140m. for a working day of eight hours, which is only 2m. gold, or a third part of his pre-war earnings.

That the increase of the wages above the pre-war standard is an entirely fictitious quantity is now realized by everybody concerned, even the most unsophisticated workman. It is true that the high figures which wages have reached are not devoid of exercising some fascination, creating some self-deception in the mind of the workingman. This fact, no doubt, has been responsible in some measure for the working classes' acquiescence in the disparity between their present and pre-war income.

The discontent thus produced has always been at the bottom of the labor problem, and its allaying was one of the chief tasks of the administration since it took the labor problem firmly in hand after the Revolution. The handling of the labor problem by the government and by the industrial associations has seldom found favorable comment, and has been grossly abused from both sides, the employers as well as the employees. When looking back to the revolution and reviewing the whole route transversed since then, there can be no doubt that the performance has so far been a very creditable one, deserving admiration rather than abuse.

THE LABOR PROBLEM

The two main phases of the labor problem are the unemployment question and the task of keeping the cost of labor down at a level which would enable the industry to recover the foreign markets and to maintain there a strong foothold. The unemployment problem was comparatively easier to deal with. It stands, of course, in direct relation to the other problem, as its best solution is to have employment for every one. From the rather haphazard way in which the unemployment problem was at first handled, consisting mainly of treasury stipends toward unemployed, it has soon taken a course of system and order, reflecting the organizing power which is one of the chief virtues of the Germans. The following figures show the percentage of unemployed in the main groups of workmen during the years since the revolution. These figures demonstrate clearly how effectively the matter has been dealt with.

	1919	1920	1921	1922
January	7.9	3.6	3.7	1.7
February	8.0	3.6	4.1	...
March	4.8	2.1	3.7	...
April	6.8	2.2	4.4	...
May	5.0	3.8	4.4	...
June	3.8	5.9	3.4	...
July	4.2	10.0	2.8	...
August	4.8	8.7	2.3	...
September	4.1	5.9	1.4	...
October	3.9	4.9	1.4	...
November	3.8	3.8	1.2	...
December	3.6	3.4	1.3	...

The great business boom starting in 1919 helped to absorb a large number of the unemployed, and cleared the field for the systematic work which the government had undertaken. The system of public stipends has not been abolished, and will probably have to be maintained for many years to come, in view of the number of war invalids. These stipends increased in the course of time with the growing cost of living. A family with three children, for instance, receives now 49.75m. per day. This is approximately 40 to 50 per cent of the pay this family would receive if its bread-winner were employed. It is not supposed to satisfy normal wants, but to keep the wolf from the door. It harbors sufficient dissatisfaction to make its receiver keen for obtaining employment. The government is, however, applying some more forcible means in the latter direc-

tion. An entirely new organization of the labor exchanges has been brought into existence for such purpose. The private labor exchanges have been nationalized, and the offices dealing with unemployment stipends put into close relation with the public labor exchanges. Regular reporting of receivers of stipends at the labor exchanges is compulsory. Although there are still some laggards who succeed in circumventing these regulations, their number is insignificant. The number of stipendiaries on March 1 was 209,000, of which 179,000 were male and 30,000 female. The number of family members of unemployed was 301,000. The total of stipends amounted in February to 114 million marks.

As it cannot be hoped that the labor exchanges will remove all the unemployed from the payrolls, and a certain residue has to be taken care of even under the most favorable circumstances, the aim of the government has been to make the huge outlay for unemployed subsidies productive. A special government department was drafted off for the organization of what is called "Productive Arbeitslosen Fürsorge"—or productive providential care of workmen. The main object of this institution is to provide work of a temporary character for unemployed on enterprises financed by the state treasury or other public funds; this work includes irrigation, hydro-electric power stations, building houses for agricultural laborers, improvement of highways, water works, river regulation, quarries, building and housewrecking. Over 400,000 unemployed have in 1921 been given work of this kind, and nearly three-fifths of the stipends have in this way been made productive. The scope of this organization has in the course of time been extended, chiefly in the direction of transferring workmen from one calling to another, according to the dictates of demand. Courses of training are maintained for such purpose. A great number of workmen who have crowded into the cities during the war have in such way been led back to the country, chiefly into agriculture. Financial assistance is even extended from means at the disposal of this organization to support private enterprises whose maintenance lies in the public interest.

Unemployment Insurance

A project has been under contemplation at an early date to develop this organization into an unemployment insurance. A law was drafted for this purpose but has apparently been shelved for the present. The object of it is to provide subsidies in the case of unemployment and sickness, also toward workmen not fully employed. The present organization, especially the public labor exchanges, play an important part in this scheme. The funds for this purpose are to be raised, one-third by the insured, one-third by the employers, and one-third by public means, that is, one-sixth part by the state, one-ninth part by the province, and one-eighteenth part by the municipalities. The claims for insurance are established if the insured has, for 26 weeks in the two years previous to his unemployment, paid his insurance fees. The subsidies granted are fixed by the Labor Ministry. They commence seven days after the beginning of unemployment. Earnings from odd jobs are deducted. Every unemployed person has to report at a labor exchange at least three times a week. During the first two weeks he has to apply to the labor exchange of his profession, thereafter at the general labor exchange. Subsidies cease if the insured refuses to accept work offered him by the labor exchange, provided this work is paid by the usual wages and is in keeping with his education or training. The latter proviso ceases after eight weeks, after which time he cannot claim relief on this account unless he can make plausible that his future career would be jeopardized by the acceptance of inferior or inadequate work.

The insured can be compelled to undertake a course of training for a different profession or an additional training in his calling. If he refuses, subsidies will be stopped for the next four weeks. The same applies to employees who voluntarily give up their jobs, or lose them by their own fault. It is a peculiar fact that the proposed law also provides for subsidies to strikers, but only after the first two weeks of the strike. In a similar way, ill people or short time workers are taken care of. If the unemployed want tools for a job offered them, which they cannot pay for themselves, such tools can be loaned them from insurance funds.

Keeping Wages Down

The second and most important task of the labor problem, to keep the level of wages down as low as possible, has two sides, a mental and a material one. The first is frequently overlooked by foreign students of the matter, although it can easily be understood that the workingmen would not acquiesce in a state of affairs which, in spite of appearances, implies for them privations, at least a lowering of their living standard, without some potent agency working upon their minds. This agency consists in the main in the belief that German goods are at a discount in foreign countries, and could not be sold abroad except by cutting prices considerably. Systematic and extensive propaganda was made demonstrating this "discount of hatred" as it is called, with the result that it is now deeply rooted in the mind of the whole population. Foreign legislation against dumping, establishing high import taxes which could easily be traced to discrimination against German goods helped to maintain this belief and strengthen it.

The workmen fully convinced by the same propaganda that the future of the country depends on the export, and aware that a cutting down of the export would materially react upon their own welfare, see no help but to moderate their own claims, not willingly, but as something inevitable. They would probably offer greater resistance than they do, even show fight, if they could refute the contentions brought forward by the employers, that they are greatly handicapped in comparison with their foreign rivals, by the so-called socialistic achievements, the eight-hour day, shop council law, and all the other parts of more or less socialistic labor legislation. Even under such circumstances it would be doubtful if the workmen would submit to the pressure exercised on the level of wages, in the comparatively resigned spirit which they are showing, were it not for the conciliatory influence of the trade unions. The latter have since the revolution gained largely in importance. They have become part and parcel of the government, exercising a strong influence on legislation. Knowing well that by lending help to a contest which would react upon the country's most vulnerable spot, the export, they would largely lose influence on both sides, they are following a policy of temporizing, acting as intermediaries in the conflict between the interests of employers and employees. Storm and stress have put some able leaders at the head of the trade unions, and they no doubt have in mind the welfare of the country as a whole.

The material side of the problem is taken care of by a whole network of regulations drawn around the adjustment of wages, organizing to a nicety the whole procedure. Claims of the workmen for higher wages are subject to strong influence, having a tendency to tone them down to the best possible compromise. This procedure is very successful, and if it is not, it is at least a lengthy one, giving employers the benefit of a level of wages long after claims for their rise have been brought forward.

The regulations created since the revolution have also tackled the problem of strikes. From the original conception of a rebellion, strikes have been moved into an atmosphere of law and order. A nicely defined distinction is now drawn between justifiable strikes and so-called "wild strikes." A strike is considered justifiable only after all means of settlement have been exhausted, and in such cases the unions will back the strikers. In the other instance, it would be a "wild strike" and the strikers could expect no assistance from the trade unions. It will be remembered that the recent railroad strike broke down on the latter account, having been declared a wild strike by the associated trade unions, with the result that help from this quarter was refused.

(To be continued next week)

Smelting Company Loses Suit

The American Smelting and Refining Co. has lost its case against the Government for recovery of $512,515 on account of the sale of copper to the Ordnance Department during the war. The company had a contract with the Government for delivery of copper at 23½ cents a pound, made in March 1918. Before deliveries were completed thereon the Government raised the price of copper to 26 cents. The smelting company sought to obtain 26 cents a pound for copper deliveries after this price advance. The Court of Claims ruled against its contention and the company took the case to the Supreme Court. In a decision announced by the court last week by Justice Holmes, the decision of the Court of Claims was affirmed, although the court said there was doubt as to whether the company could sue the Government for damages arising out of the contract.

The Co-ordinating Machinery of Government

Last year the expenditures of the Federal Government totaled $5,538,040,-689.30. The routine work in handling such a vast sum is enormous. By the imposition of a unified plan and policy upon the business organization of the Government, large savings have been effected. The total expenditures during 1922 will be more than $1,600,000,-000 less than those of 1921. A part of that reduction must be credited to the economies effected by the clearing house organization within the Bureau of the Budget, over which the chief co-ordinator presides. The chief co-ordinator is Col. H. C. Smither, of the General Staff of the Army, who has been thrice cited for distinguished military service and who holds the Distinguished Service Medal for his work in organizing the supply section during the period of the arrival of American troops in France.

The co-ordinating machinery which the Government has set up is simply the plan which has long been in successful operation among the very large industrial enterprises, modified to suit the special needs of the executive departments. The working of this machinery was described by Col. Smither on May 17, when he addressed a large gathering of industrial engineers at Philadelphia. The meeting was conducted under the auspices of the Atlantic Chapter of the Society of Industrial Engineers.

Col. Smither said that there are few business organizations within the United States whose operations are of sufficient magnitude to be comparable with the business of the Government, and these few have recognized that on a scale so large, the central direction of operations can be conducted successfully only by co-ordination instead of consolidation. The suggestion is being offered continually as a business principle that the similar business routine functions of Government should be consolidated in a single body that shall serve all departments. Those who propose such amalgamation of functions are influenced by a desire to conform to the usual practices of single business institutions in the commercial world. They seldom have the information at hand to enable them to recognize whether these functions are sufficiently alike in character to make possible a homogeneous organization or whether the advantages to be gained, if any, are sufficient to offset the loss of initiative to which the separate subdivisions of the Government inevitably would be subjected.

An organization, while influenced in the efficiency of its operation by the fact that the individuals composing it are subject to human emotions and are possessed of varying degrees of intelligence, is none the less a machine and its capacity to perform its work is measured by precisely the same units that determine the potentiality of a mechanical power unit. The potential energy of which it is capable is a function of its solidarity as a body, coupled with flexibility in arrangement such as will facilitate the transaction of business by the separate elements of the organization with the desired dispatch. There must be sufficient compactness in the body of the Federal organization to permit of the efforts of its separate business elements being directed without either dispersion or congestion of their working forces and at the same time permit of the deployment of each department of its own particular forces with a speed commensurate with the need of the department in the accomplishment of its mission.

It is apparent that the underlying principle of co-ordination is to bring into the Federal organization as a whole that quality which corresponds to the mass of a power unit and to permit dispatch in the transaction of business at a rate commensurate with its needs. Too rigid a control may act to depreciate the speed factor to an extent so great as to interfere materially with the separate elements of government in the accomplishment of their respective missions. It follows as a corollary that the principle of organization on a large scale is a flexibility in the organization as a whole, coupled with freedom of action by its units all directed harmoniously to a common end.

COL. H. C. SMITHER

Unless every act contemplated in securing co-ordination is carefully considered as to its effect upon these two factors of mass and speed, there is always danger that mere personal opinions may be mistaken for principles.

Government Cuts Ordinary Expenses in Half

Ordinary expenditures of the Government for the ten months period from July 1, 1921, to April 30, 1922, amounted to $2,819,876,115.40 as against $4,277,863,186.23 in the corresponding period ending April 30, 1921.

Expenditures for the month of April amounted to $242,560,-961.82. The largest item was the interest on the public debt which amounted to $121,822,-074.35. The Treasury expended $46,616,328.82, the War Department $35,241,287.96, the Veterans Bureau $33,760,477.19, and the Navy Department $23,-481,074.86. The expenditures under the Transportation Act were $43,537,901.60.

Chamber of Commerce of the United States in Convention at Washington

At the close of its four-day convention held in Washington last week, the Chamber of Commerce of the United States elected Julius H. Barnes, of Duluth, Minn., president for the next year. Vice-presidents elected were A. C. Bedford, of New York; Thomas E. Wilson, of Chicago; Harry Black, of Galveston; and Thomas B. Stearns, of Denver.

One of the most important addresses of the convention was that delivered on Tuesday morning by Arthur Balfour, vice-president of the Association of British Chambers of Commerce, and a prominent steel manufacturer in England. Mr. Balfour's words touched on many of the problems which are facing the industrial world both in Europe and in America today. On the question of exchange rates he remarked that the less politicians and governments have to do with attempts to adjust the exchange, the sooner we are likely to reach a safe and steady basis on which we can trade.

Speaking of labor conditions in England he said: "I am able to report to you many distinct and hopeful signs in Europe and particularly in Great Britain. We have had great labor disturbances in England and so long as the government interfered between the employer and employee no settlement was ever reached which the particular industry could support from an economic standpoint. It is an impossible situation for a government which depends on votes to endeavor to adjust wage questions between employer and employee, and the government of Great Britain has now realized this fact and has definitely stepped out of the arena. The consequences are that wage adjustments are now being made between the two interested parties."

Mr. Balfour declared that in his opinion attempts by some countries to shut out German goods were poor business economics. In the first place, as Germany has to do some export trade it is much better to let her spread this trade normally over the world rather than to control specific markets. In the second place, if she is to pay reparation she can only do so by trading, as in this way only can she secure currency acceptable to the Allies.

The attempt to run Russia on Communistic or Bolshevik ideals has proved a vast and complete failure, according to Mr. Balfour. He explained how Bolshevik propaganda had been spread throughout Europe in an attempt to force other countries to come to the aid of Russia, as a return for the withdrawal of this propaganda.

In closing his address Mr. Balfour said: "I can say to you that in England certainly, and in some of the other countries, we have seen the worse. We are reaching economic conditions where trade on a proper basis will again be possible and I am hopeful that before the end of the year trade will begin to flow in its normal channels and the disastrous unemployment will gradually pass away."

At the Wednesday morning session John R. Delafield of New York gave an interesting discussion of the allied war debt to the United States. He discussed the effect of the payment of principle or interest of this debt upon the United States exports and on the home market. "Where there is unem-

ployment," he said, "the purchasing power of the people becomes limited correspondingly, for it is the workers who are also the consumers. Prosperity requires the greatest number of consumers at home as well as abroad, and by cutting down on the industrial and agricultural activity of the country through any cause, we also diminish the home market by impairing the purchasing ability of our own people.

"The effect of the repayment of these loans and of the interest upon them will therefore, be cumulative, and will, in itself, not only diminish our export trade, but also cut down our home consumption. The less exports, the less domestic trade, for the buying power of our people is diminished.

"It is for us, then, to do all we can to overcome this handicap, and certainly not to do anything to increase the disadvantage under which we labor. What is the amount of these foreign debts to us, repaid as they will be over a long series of years, beside our prosperity and the well-being of our people? Even the amount of these loans is but small compared with the great increase of wealth our country would create in a period of great economic prosperity."

In his address "American Relations to Russia," Secretary of Commerce Hoover analized this problem from an economic standpoint. He offered strong arguments against frequent assertions that the United States is responsible for the situation in Russia today. His remarks, backed by his intimate knowledge of the situation, created a strong impression on his audience. In concluding his address he said: "When all is said and done, the great problem still stands out. Russia is slowly dying because the dynamic forces of production and foreign confidence have not yet been restored. We, a great Christian people, look with horror and deepest sympathy upon her untold miseries. We wish to find foundations in realism for assistance to the Russian people. To extend this help requires a vast restoration of confidence. It requires a restoration of the processes of business and commerce. Russia is making progress in these directions. We wish to help but where does lasting help lie except in the firm and final re-establishment of those basic fundamentals that we have already stated?"

On Tuesday afternoon the cornerstone for the chamber's new home was laid in the presence of over five thousand business men and government officials. The building is situated in Lafayette Square, facing the White House.

During the course of the convention the chamber passed several resolutions expressing its opinions on questions of moment. One of the resolutions urged that the United States take steps to be represented officially at the deliberations of the reparations commission: Another resolution expressed the desire that the United States take its place with the other nations of the world in the International Court of Justice. The chamber also, by resolution, urged Congress to enact legislation which would aid in the speedy settlement of war claims against the governments of Germany, Austria and Hungary. Resolutions also repeated the recommendations in favor of government aid to the merchant marine, and requested congress not to reduce the authorized personnel of the Army and Navy below the strength conservatively requisite for national safety.

Business Items

The Hoggson & Pettis Manufacturing Co., New Haven, Conn., has taken over the six-story building, of which it has occupied part, and is equipping it to take care of expanded lines including the Sweetland lathe chuck, marking devices and rubber molds.

The Bristol Company, of Waterbury, Conn., manufacturer of recording instruments, has opened a branch office in Philadelphia at Room 1311 Widener Bldg. C. C. Eagle, Jr., service engineer, is in charge.

The Pryibil-Genzlinger Machine Co. has been organized in New York City with offices at 220 West 42nd St. P. Lester Pryibil, formerly vice-president and general manager of the P. Pryibil Machine Co., of New York, and Frederick M. Genzlinger, mechanical engineer, are the partners.

Gaston & Co., Inc., of 165 Broadway, New York City, has purchased the business of Gaston, Williams & Wigmore, Inc., of New York. The personnel of the old company will not be changed. Through this New York branch, and that of Gaston, Ltd., of London, the organization will continue to represent manufacturers and aid them in marketing their products.

The J. M. White Motor Co. has been appointed distributing agents in the Sioux City, Iowa, district, for the Wills-St. Claire Motors Co.

The Sigwart & Ralston Machine Works, Inc., Pittsburgh, Pa., has been sold to the Luster Coated Sheets Co.

The Hofius-Hudson Machinery Co., has been incorporated at Tacoma, Wash., with a capital stock of $40,000. Directors are R. S. Holt, 1115 Fidelity Bldg., Tacoma; George J. Danz, Hill Hudson and Phillip Kitchin.

The R. C. Hyde Company has opened offices in the Security Mutual Bldg., Binghamton, N. Y., and is prepared to handle general power plant and mechanical engineering commissions, including electrical installations, power plant equipment, testing and machine design.

The William H. Wilson Iron Works of Rochester, N. Y., manufacturer of structural iron, fabricated steel shapes for bridges and buildings, etc., has opened an office in the Powers Building in Rochester. This office will handle the designing, estimating and engineering work and will be under the direct supervision of L. M. Sanford, who for several years has been in charge of the structural department of the plant.

The Westgate Metal Products Co., has been organized at Oakland, Cal.; capital stock reported $2,500,000. The concern will manufacture castings, tools and fixtures. Directors are A. T. Burch, B. I. Marshal, A. L. Stedebaker, D. S. Riggs, Antone Weber and J. M. Shaw.

The National Steel Barrel Co., of Cleveland, Ohio, has established a plant at 1500 Tchoupitoulas St., New Orleans, for the manufacture of steel barrels. The district manager is S. H. McAllister. The plant has a capacity of 1,200 steel barrels a day and is intended primarily to look after the increase of oil for export from this city.

Plans for a new commercial and passenger car axle factory for Cleveland, Ohio, were announced last week by Viggo V. Torbensen, former president of the Torbensen Axle Co. The new concern will be known as the Vig-Tor Axle Co., and Mr. Torbensen will be president. Associated with him will be A. L. Kroesen, vice-president and general manager; W. N. Jackson, treasurer; Carl R. Harrison as secretary.

The Babcock Printing Press Manufacturing Co., New London, Conn., manufacturer of printing presses, etc., has increased the capital stock of the company from $650,000 to $800,000, to be utilized for business improvements.

The Lux Clock Manufacturing Co., Inc., Waterbury, Conn., manufacturer of clocks and time systems, has increased its capital stock from $150,000 to $300,000.

The Hartford, Conn., office of the Detroit Steel Products Co., Detroit, Mich., was discontinued on May 1, and was consolidated with the New York office of the company, at 110 West 42nd St. D. C. Sullivan, manager of the Hartford office, will become affiliated with the New York branch.

The Graham Manufacturing Co., of Torrington, Conn., has filed papers of incorporation under the laws of Connecticut to engage in the manufacture of metal goods, etc. The capital stock is $150,000, and the incorporators are: James H., Joseph F., and C. A. Graham, of Torrington. The concern recently obtained a lease on space just opposite the Torrington Railroad station, and will begin operations.

Personals

DAVID B. RUSHMORE, chief engineer of the power and mining department of the General Electric Company, has been appointed to the staff of consulting engineers of the company.

COL. ARTHUR HATCH, president and general manager of the Canada Steel Goods Co., Hamilton, Ont., has been elected president of the Canadian Manufacturers' Association.

ARTHUR JENNER, factory superintendent of the Noiseless Typewriter Co., Middletown, Conn., has resigned that position. He will take a trip to Europe, returning to the United States late in July.

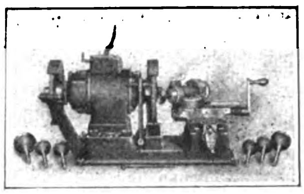
DR. CHARLES E. A. WINSLOW has been appointed health supervisor of the new department of the Safety Institute of America. This department will study the influences which affect the health of industrial workers and will make such recommendations for curing them as may seem fit. Dr. Winslow is professor of public health at the Yale School of Medicine, and has been prominently identified with health organization in the United States and Europe.

MARVIN E. MONK has been appointed assistant sales manager in charge of general sales of the U. S. Ball Bearing Manufacturing Co., of Chicago. Mr. Monk was formerly special sales engineer for Manning, Maxwell & Moore,

Condensed-Clipping Index of Equipment

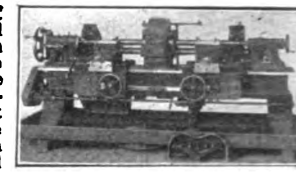
Patented Aug. 20, 1918

Grinding Machine, Valve-Facing and Tool, Collins
Ford C. Close Co., Inc., 2 Rector Street, New York, N. Y.
"American Machinist," February 2, 1922



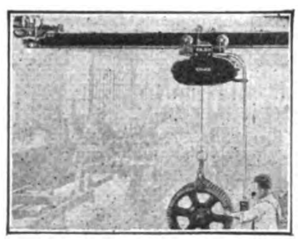
The device is used for precision work in surfacing valves and valve seats of automotive engines. A ½-hp. motor carries a 6-in. grinding wheel at each end of the spindle. The motor speed is 3,450 r.p.m. for either direct or alternating current. The left wheel is for grinding cutting tools, and the right wheel is for facing the conical surfaces of the valves and for grinding the reamers used in cutting the valve seats. A transverse screw adjusts the valve for the proper depth of cut. Longitudinal motion is given to the work by the feed screw crank.

Lathe, Center-Driven, Axle
Reed-Prentice Co., Worcester, Mass.
"American Machinist," February 2, 1922



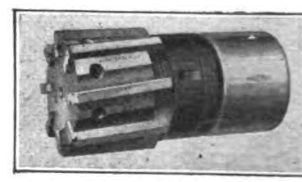
This machine turns both ends of the rear axles of automobiles and mine-car axles. The center portion of the work is gripped to provide the necessary torque, and cannot be machined. The drive to the headstock spindle is from a motor of at least 7½ hp., controlled by a treadle at the front of the machine. Each carriage has its own automatic feed trip, although both are driven by a single set of gearing. The machine will turn shafting up to 2⅞ in. in diameter, with slight modifications to 3½ in. in diameter. Bed, 9 ft. Distance between the centers, 72 in. Length, 10 ft. Width, 40½ in.

Crane, Electric, Hand-Power
Cleveland Crane & Engineering Co., Wickliffe, Ohio.
"American Machinist," February 2, 1922



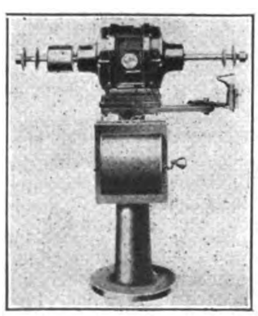
The crane is equipped with an electric hoist controlled by a push button at the bottom of a pipe carrying the handle, or can be furnished with a chain block suspended from a trolley for hand operation. In the former, the operator controls with one hand the raising, lowering and moving the load, and with the other hand steadies the load. The crane has a capacity up to 1 ton. The outfit can be furnished in different lengths with a maximum distance between runways of 24 ft. The I-beam depth varies from 7 to 10-in., but a 26-ft. I-beam can be furnished.

Reamer, Expanding, Heavy-Duty, "Bull-Dog"
Wetmore Reamer Co., 62 South 27th St., Milwaukee, Wis.
"American Machinist," February 2, 1922



The tool can be furnished with either six, eight or ten blades, according to the reamer size. The blades are set at a left-hand angle, with the front cutting edge on a 3-deg. angle. All threads are milled on centers, and the blade seats are ground with the threads as the locating points. The cone nut and graduated screw give adjustment to a thousandth of an inch. An adjustment wrench is furnished with each reamer. The tongue driver relieves the strain on the coupling nut.

Buffer and Grinder, Motor-Driven, Floor Type
Valley Electric Co., 3157 S. Kingshighway, St. Louis, Mo.
"American Machinist," February 2, 1922

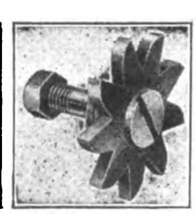


The machine is adapted to use in tire shops, machine shops, buffing and polishing rooms. The motor shaft is extended and threaded at both ends. The inclosed motor is mounted on a heavy cast-iron pedestal, on the front of which is a safety switch. A tool-rest, guards and a driving pulley may be furnished. The motor, furnished with ¼ to 4 hp. and either single-phase or two or three-phase, operates on 60-cycle current of either 110, 220 or 440 volts, and has a speed of 1,800 r.p.m. Floor space, 14 in. in diameter. Weight, 130 to 330 pounds.

Grinder, Electric, Alternating-Current, Bench and Floor
Standard Electric Tool Co., Cincinnati, Ohio.
"American Machinist," February 2, 1922

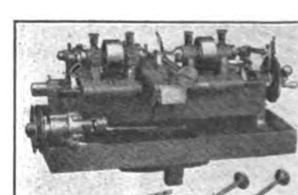
The machine is fitted with double-row ball bearings and has a Westinghouse motor equipped with a circuit breaker and furnished for either 110 or 220 volts, in single, two or three phases. The wheels used are 8 in. in diameter, have ⅝-in. face and ⅝-in. hole, and extend in front of the body of the motor for grinding long and irregular castings and bars. One coarse and one fine wheel and a 10-ft. reinforced cord and plug are furnished. A make-and-break switch is located on top of the motor. Weight, bench machine, 110 lb.; floor machine, 225 pounds.

Chip Remover, Saw-Tooth, Automatic
Henry Disston & Sons, Inc., Philadelphia, Pa.
"American Machinist," February 2, 1922



This device consists of a special toothed wheel, made to fit any type of saw, and a stud to carry the wheel, as shown in the illustration at the right. It keeps the saw teeth and gullets free from chips, as the chips from the cut are apt to stick to the sides and points of the teeth and score the work, or even cause breakage of the teeth. This trouble is particularly noticeable when cutting soft stock. The application to the saw is shown at the left.

Milling Machine, Valve, Duplex
Dale Machinery Co., New York, N. Y., and Chicago, Ill.
"American Machinist," February 2, 1922



The machine is intended for milling key-slots in automotive valve stems and similar work. It has two heads, each with its own spindle and pulley and collet chuck for holding the end milling cutter. A device holds the heads stationary while cutters are changed or adjusted. The work is held in a V-block. The cutters operate simultaneously. Feed is obtained through a ratchet operated by mechanism at the rear. The machine handles work up to ½ in. in diameter, and will mill slots up to ¼ in. in diameter and ½ in. long. Bench space 20 x 16 in.

Clip, paste on 3 x 5-in. cards and file as desired

Inc., New York City. J. J. Torpey will continue as assistant sales manager in charge of bearing distribution.

J. MARTIN DUNCAN, follow up engineer of the Detroit Steel Casting Co., Detroit, Mich., has been promoted to be general sales manager. He is being succeeded by E. R. Young. Mr. Allen, formerly sales manager, has been made assistant general manager.

DAVID WING, who has been associated prominently with many of the Government's activities touching coal, has been designated by Secretary of Commerce Hoover to act as the department's point of contact with trade associations desirous of discussing plans for submitting their statistical data to the department.

GEORGE W. SANFORD has been chosen general manager of the Bristol Brass Co., Bristol, Conn., brass manufacturers. He is at present engaged as purchasing agent for the City on the new High School building in Bristol, and will take over his new duties just as soon as he is completed with this work. Mr. Sanford was at one time with the Marlin-Rockwell Arms Co., New Haven.

HARRY W. BLIVEN, general sales manager of Harvey Hubbell, Inc., manufacturer of electrical goods, machine screws, machine products, etc., of Bridgeport, Conn., has recently been elected vice-president of that company. Mr. Bliven has been associated with the Harvey Hubbell Co. for over twenty years.

GARRETT W. B. BLANCHFIELD, of Hartford, Conn., has been appointed New England manager of the Peerless Weighing Co., of Detroit, Mich., manufacturers of weighing machinery.

Obituary

WILLIAM J. HENIFER, assistant chief of the reclamation department of the Aluminum Company of America, was killed by a locomotive in the yards of the company at Massena, N. Y. He was 33 years old.

SAMUEL L. MINER, a director of the Morris Machine Tool Co., Cincinnati, Ohio, died in that city on May 3. He was 82 years old.

FRANK W. EDWARDS, sales engineer for the Dayton Engineering Laboratories Co., died at his residence in Dayton, Ohio, from an acute attack of pneumonia. He had been associated with the Delco organization for more than a decade.

JOHN J. BRUCE, president and treasurer of the John J. Bruce Foundry Co., Cincinnati, Ohio, died in that city on May 16. He was 72 years old.

FRANK D. CHRISCADEN, assistant sales manager of Wicks Brothers, Saginaw, Mich., died at his home in that city on May 15.

LEGRAND SKINNER, founder of the Skinner Engine Works, Erie, Pa., died last week in his home in that city.

H. ZURCHER, JR., secretary-treasurer of the Canton Bridge Co., died last week at his home in Canton, Ohio. He was 42 years old. He had been associated with the Canton concern for the past 21 years.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

An agency is desired by a company in Sweden for the sale of technical novelties, electro-technical material, machinery, and other such articles. Quotations preferred c.i.f. Swedish port. Reference No. 2020.

A mercantile firm in Sweden desires to purchase packings, beltings, wood-working and iron-working machinery, and foundry machinery and requisites. Quotations should be given f.o.b. American ports or c.i.f. Swedish ports. Terms: Cash against documents or upon receipt of goods. Reference No. 1865.

The purchase is desired by a firm in Spain of piping for ships, copper plates, steel wire bound with hemp, raw steel for making tools, steel files, machinery for repairing ships and ship's motors, etc. Quotations should be given c.i.f. Spanish port. Correspondence desired in Spanish. Reference No. 2074.

A business man in Italy desires to open several quick shoe repair shops similar to those in the United States, and wishes to purchase machinery and full equipment for them. Terms: Cash against documents. Reference No. 2075.

An inquiry has been received from a firm in India desiring to purchase crude-oil engines of 10 to 50 horsepower, suitable to run flour mills, rice hullers, oil presses, sawmills, etc.; structural materials, such as beams and girders; and hardware, such as hinges, bolts, screws, nails, plates, bars, and needles. Quotations desired c.i.f. port of India. Terms: Cash with order. Reference No. 2048.

The purchase is desired by a firm in England of steel tubes and electrical accessories in large quantities. Quotations preferred c. i. f. English port. Shipment should be made via Liverpool or Manchester. Reference No. 2022.

Trade Catalogs

Cold-drawn Steels. Pittsburgh Tool Steel Wire Co., Monaca, Pa. A 24-page booklet describing a line of cold-drawn steels,—tool, alloy and high-speed steels, keystock, needle bar stock, Norway iron and welding wire.

Colt Autosan. Colt's Patent Arms Manufacturing Co., Hartford, Conn. A circular describing the recently perfected No. 21 washing machine for metal parts. The machine is illustrated in its various phases of operation.

Flexible Shafts. N. A. Strand & Co., Chicago, Ill. Catalog No. 22, describing and illustrating a complete line of flexible shafts and equipment. Several types of machines are shown, equipped with this shafting, for drilling, tapping, grinding, reaming and other operations.

Shapers and Milling Machines. The John Steptoe Co., Cincinnati, Ohio. A large and well-prepared catalog describing and illustrating the line of Steptoe shapers and milling machines. Various models are shown, with their special features described in detail.

Newark Gear Cutting Machines. Newarg Gear Cutting Machine Co., Newark, N. J., Catalog No. 3, describing a line of Newark spur gear cutting machines. The pages are profusely illustrated with photographs of the machines and their parts. Specifications for several models are included.

Sprague Electric Drive for Newspaper Presses. Sprague Electric Works, New York City, N. Y. Bulletin No. 48,717, describing some recent improvements in electric motor drives for all sizes and types of newspaper and other printing presses. Types of motors and controlling apparatus are shown, as well as actual installations of the systems.

Book Reviews

The Engineering Index for 1921. Published by the American Society of Mechanical Engineers, 29 West 39th St., New York City. About six hundred pages, 6½ x 9½ in., bound in red cloth-boards. Price $6.

A carefully selected summary of articles taken from over six hundred engineering and technical publications. Each item contains the exact title of the article indexed; the author's name, if given; the name of the periodical in which the article appeared; the volume, number and date of publication. There is also included a brief note summarizing the contents of the article. The items are arranged alphabetically and are cross-referenced, making it easy for the reader to locate any article wanted. The index contains over 1,400 such items.

Tensile Properties of Some Structural Alloy Steels at High Temperatures. Technologic Paper No. 205, of the Bureau of Standards, Department of Commerce, by H. J. French. Complete copy of the paper may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price five cents.

In the production of ammonia by the Haber process, gradual elongation and ultimate fracture of bolts in converter chamber heads have introduced serious operating difficulties, indicating the need for exact information on the high temperature tensile properties of various alloy steels. The paper gives the determination of tensile strength proportional limit, elongation, reduction of area and strength at fracture throughout the range 20 to 550 deg. C. for four steels containing about 0.38 per cent carbon, as follows: plain carbon steel; 3½ per cent nickel steel; 3 per cent nickel; 1 per cent chromium steel; 1 per cent chromium; 0.2 per cent vanadium steel.

Microphotographs of the fractures, as well as tables and curves illustrate the results. Of the four steels tested in normalized condition, the two alloys containing chromium showed greater resistance to weakening by increase in temperature to about 550 deg. C., and at this highest temperature the chromium-vanadium steel was preferable from its high tensile strength and limit of proportionality. Carbon and 3½ per cent nickel steels behaved alike with rise in temperature, and at about 550 deg. C., the addition of nickel had small effect on tensile properties of carbon steel. At 550 deg. C., the strength and limit of proportionality of chromium-vanadium steel were more than twice that of carbon steel, while the ductility of the former, as measured by elongation and reduction of area, was half the latter, though still quite high. Below 475 deg. C., the strength of nickel-chromium steel was greater than chromium-vanadium and both showed higher strength values from 20 to 550 deg. C. than carbon or 3½ per cent nickel steels. The fractures of carbon and 3½ per cent nickel steels at about 550 deg. C. showed a tendency to follow the grain boundaries, while the fractures of chromium-vanadium steel appeared largely transcrystalline.

Forthcoming Meetings

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

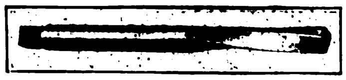
Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

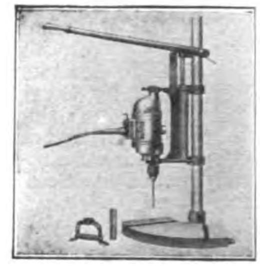
Patented Aug. 20, 1918

Reamer, Taper, "Cutwell"
Bickford-Switzer Co., Greenfield, Mass.
"American Machinist," February 2, 1922.



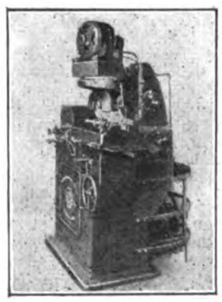
The reamer has three right-hand helical flutes. Two of the lands are relieved clear up to the cutting edge, while the third land is relieved for only about two-thirds of its width, leaving the remainder of circular section to act as a steadyrest. The reamer can be best driven by power. A chucking or hand reamer for parallel-sided holes is made with three equally spaced and fully relieved cutting lands. midway between two of which is a narrow unrelieved land which acts as a steadyrest.

Drill Stand, Bench, Lever-Feed
United States Electrical Tool Co., Cincinnati, Ohio.
"American Machinist," February 2, 1922.



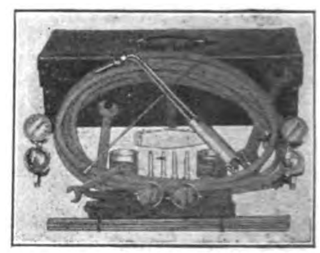
The stand holds portable and electric drills so as to adapt them to precision work. The drill may be easily clamped on the sliding head of the stand, and fed to the work by means of a hand lever. The height of the drill above the table is adjusted by sliding the head on the vertical column. The base is provided with T-slots. The stand is adapted to automobile garage and repair shop work, and holds ⅜ or ½-in. portable electric drills. Weight, 68 pounds.

Grinding Machine, Hob, Automatic, Motor-Driven, No. 815.
H. E. Harris Engineering Co., Bridgeport, Conn.
"American Machinist," February 2, 1922.



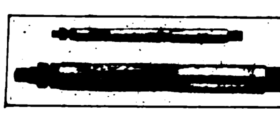
The machine grinds either right- or left-hand helical flutes, and sharpens form cutters, Curvex cutters or gear cutters, singly or in gangs. The head and motor can be swiveled about the wheel center line. Besides the 1-hp. motor driving the spindle, a ½-hp. motor drives the table, the indexing mechanism, the work-rotating mechanism, and the pump. A helix can be cut on work 8 in. in diameter to 47 deg. either right or left. The indexing head is heavier than formerly with longer bearings farther apart. The machine will index from 2 to 26 divisions. Controls located at the front. can be adjusted while the wheel is running. Table feed, 28 ft. per minute.

Welding Outfit, Garage, Acetylene, "American," No. 55.
Alexander Milburn Co., Baltimore, Md.
"American Machinist," February 2, 1922.



The outfit is intended for both welding and carbon burning and is packed in a fiber carrying case. The "American" torch is 16 in. long, and of the balanced-pressure type. The gas tubes are made of seamless tubing, while the torch head is made from solid wrought brass. All mixing of the gases occurs in the tip. The torch is provided with five tips of different sizes. The outfit includes hose and connections, welding rods and flux, goggles, gloves and a lighter.

Reamer, Expansion, Spiral-Fluted
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," February 2, 1922.

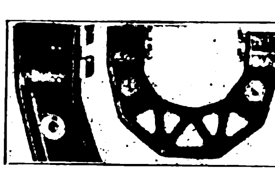


The adjustment provides a range of sizes for each reamer. The helical flutes give free and clean cutting action. The helical blades pass safely over the corners of keyways. The reamer is equipped with a locknut to hold the size, and a safety stop which prevents over-expansion and indicates the max imum limit. The reamers are made in all the regular sizes.

Engraving Machine, Motor-Driven, No. 1-8
George Gorton Machine Co., Racine, Wis.
"American Machinist," February 2, 1922.

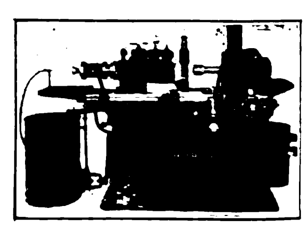
The machine is heavier and has a greater capacity than the former machines; it cuts dies, steel stamps and large-size letters in steel, brass and cast iron. The pantograph is adjustable to give a ratio of reduction of from 1:1 to 6:1, or a larger pantograph may be furnished having a reduction of 2:1 down to 8:1. Longitudinal table travel, 17½ in. Saddle crossfeed, 8¼ in. Speed 1,800 to 8,000 r.p.m. Table, 10 in. wide, 30 in. long. Depth, 48 in. Width, 60 in. Height, 68 in. Weight, 1,800 lb. Export box, 148 cu. ft.

Gages, Square-Anvil, "Trusform"
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," February 2, 1922.



In the adjusting and locking device two opposed headless setscrews in the frame pull against each other. Square anvils permit of working up to a shoulder, and give a larger wearing surface. This type of anvil is interchangeable with the round-head type, and new anvils may be substituted at any time.

Grinding Machine, Internal, "Hydroil"
Greenfield Tap and Die Corporation, Greenfield, Mass.
"American Machinist," February 2, 1922.



High traverse speeds are employed on the machine. The wheel spindle is carried on a slide controlled by a feed screw calibrated for feed increments of 0.00025 in. The work table reciprocates upon ways and carries a work head for holding and rotating the piece. The table traverse speed is controlled by the regulation of a sensitive throttle valve. For large bearing races with straight holes, a special workhead is provided. A single hand lever controls all table motions. A pedal is used to stop and start the work. Table speeds, 2 to 36 ft. per minute.

Clip, paste on 3 x 5-in. cards and file as desired

New and Enlarged Shops

Machine Tools Wanted

Fla., Lake Wales—The Johnson Motor Co., (automobile repairs), A. Johnson, Mgr.—machine shop equipment and machinery, (used).

Fla., Oldsmar—Oldsmar Mfg. Co.—machine shop and foundry equipment.

Ga., Columbus—T. Huston Mfg. Co.—30th St., C. R. Medley, Pres.—one 24- to 30-in. engine lathe, equipped with taper attachment, four-jaw chuck, steady rest, etc. (used.)

Md., Baltimore—C. E. Stevens Bros., Inc., 124 Hopkins Place, (manufacturer of bags)—lathe, 12- or13-in. swing (used).

N. Y., Falconer—Progressive Machine Co., West Main St.—lathes, drilling machines, power presses and other machine shop equipment.

N. Y., Gouverneur—The Gouverneur Welding & Machine Wks., Park St., F. Scozzafava, Purch. Agt.—acetylene welding outfit suitable for heavy work, also small used 18 in. hand lathe.

N. Y., Jamestown—Third & Lafayette St. Garage, S. G. Robbins, Pres.—machinery, tools and equipment.

N. Y., New York—Hopp Bros., 132 West 14th St.—3 power shears and 1 36 in. square.

N. Y., Niagara Falls—F. Tanbellini, 2461 Cudaback Ave.—tools and machinery for proposed garage and repair shop.

N. Y., Olean—Lucas & Marra, 33 North 1st St.—machine tools and equipment for improved auto garage and repair shop.

N. Y., Sacket Harbor—R. Gowing Co., Main St., (boat manufacturer), R. Gowing, Purch. Agt.—14-16 in. back geared engine lathe and upright post drill, (new or used).

N. Y., Westover—Boland & Bartlett, (machine shop and garage), C. Bartlett, 131 Hawley St., Binghamton, Purch. Agt.—complete machine tool equipment for motor repair station.

O., Columbus—The Carroll-Thompson Co., 555 East Long St., J. L. Thompson, Pres.—one grinder for service station.

O., Columbus—Snyder Auto Co., 70 South 4th St., H. B. Snyder, Purch. Agt.—one drill press, one grinder and 2 or 3 raised racks for turning over autos for repairing.

O., Columbus—C. Zimmerman & Sons Co., 269 Broad St., P. Seeds, Service Mgr.—lathe, grinder and new equipment for service garage.

O., Painesville—The Ohio Mfg. Co.—small circular shear.

Pa., Grove City—P. Hassel—machinery and equipment for garage on Mercer-Grove City Pike.

Pa., Phila.—C. B. Leonard, 2429 West Allegheny Ave., (machinist)—lathes, boring machines, milling cutters, etc.

Pa., Phila.—The Pennsylvania R.R., 18th and Filbert Sts., S. Porcher, Purch. Agt.—small machine tools and number of riveters.

Pa., Pittsburgh—The Flannery Bolt Co., Vanadium Bldg.—1½ in. Landis bolt cutter.

Pa., Sharon—New Bell Garage, South Irvine Ave.—machinery and equipment for garage.

Pa., Sharpesville—L. Moderella—tools, machinery, etc., for small auto shop, also air compressor and tire shop equipment.

Va., Richmond—A. Reeves, 311 West Broad St.—grinding machines and lathe.

Wis., Osse—C. J. Amundson—equipment and machinery for auto repair shop.

Wis., Milwaukee—American Sheet Metal Works, 255 Lake St., C. Koch, Purch. Agt.—power punch for 19 gage plate.

Wis., Milwaukee—F. R. Dengel Mfg. Co., 336 4th St., plumbing supplies—additional machine tools including lathe and drill press.

Wis., Milwaukee—Wisconsin Grey Iron Fdry. Co., 39th Ave. and Burnham St., J. A. Burke, Purch. Agt.—several electric power molding machines.

Wis., Plymouth—The Central Garage, C. C. Arndt, Secy.—small power machinery and equipment for auto repairs.

Ont., Chatham—Weaver Mfg. Co., Richmond St., W.—tools and machinery for the manufacture of garage equipment.

Ont., Kingston—T. Watson Co., Ltd.—equipment for machine shop and foundry and for the manufacture of concrete mixers, crushers, and road machinery, including steel working machinery, lathes, drills, etc.

Ont., Kitchener—R. Kleinschmidt, Frederick St.—equipment for new garage and repair shop.

Que., Montreal—A. Brabant, 88 Shannon St., equipment for garage and repair shop.

Ont., Ottawa—The Board of Control, City Hall, A. F. Macallum, Engr.—Will receive bids until May 30, one variety saw, one Buzz planer or joiner, one Ball threading machine, one Universal tool and cutter grinder, one power forcing press, one Scleroscope, one combination gas furnace, one kerosene asphalt tool heater, two 2¼ in. diameter Ingersoll-Rand drills, one small portable gasoline operated air compressor, one quarry jackhammer or hammer drill.

Machinery Wanted

Fla., Loughman—The Everglades Cypress Co., J. W. Tucker, Mgr.—engines, sawmill equipment and machinery.

Fla., Tilton—Thorn Reed Lumber Co., address, H. P. Thorn, Martinsburg, W. Va., Purch. Agt.—woodworking machinery for the manufacture of spokes, axe handles, etc.

Ga., Macon—Willingham Sash & Door Co., O. P. Willingham, Jr., Vice-Pres.—one 48-in. or 49-in. sander, late type.

Ga., Savannah—Georgia Cane Syrup Co., 103 West 43rd St.—machinery for bottling syrup, hot syrup filters, etc.

Ill., Elksville—The Journal, (newspaper)—power paper cutter.

Kan., Neosha Falls—The Post—newspaper press, job press and equipment.

Ky., Sadieville—New Eva Milling Co., W. W. McCabe, Pres.—machinery and equipment for mill (feed, grain, etc.).

Mich., Cathro—L. Austin—shingle mill.

Mich., Detroit—The Curtis Co., Lafayette Blvd.—miscellaneous presses and printing machinery.

Minn., Minneapolis—Bd. Educ., 305 City Hall, G. F. Womrath, Business Supt., will receive bids until May 25, refrigerating machinery for Northeast, Roosevelt Junior and Jordan Junior High Schools.

Minn., Walker—The Walker Creamery, C. E. Rausch, Prop.—5 or 7 hp. motor, lineshaft, hangers, pulleys and belting; 2 galvanized iron storage tanks, 4 x 2 x 10 ft. and 2 x 2 x 8 ft. respectively, also one water pump with motor.

Mo., Joplin—C. L. Clark, 2402 Empire St., (machinery dealer), H. Johnston, Purch. Agt.—heavy belting, shafting for concentration mill for mines.

Mo., Joplin—The Labor Tribune, 4th and Joplin Sts., D. Grafton, Purch. Agt.—8 column power press for daily newspaper also 3 linotype machines.

Mo., Kansas City—Fuller & McClintock, Produce Exchange Bldg., J. R. McClintock, Purch. Agt.—traveling cranes, water tube boilers, water wheels, large high duty air compressors, crank and fly wheel pumping engines, radial block stacks, stokers, centrifugal pumps and coal handling equipment.

Mo., Kansas City—J. M. Pate, Andover 7—Universal woodworking machine.

N. C., Goldsboro—The Utility Mfg. Co., J. L. Borden, Pres.—new machinery for proposed veneering plant.

N. C., High Point—Ellison Furniture Co., O. H. Ellison, Purch. Agt.—woodworking machinery, including carving spindle, mortising machine and dove-tailer.

N. C., Mt. Pleasant—A. M. Haithcock—flour mill machinery.

N. C., Shelby—A. P. Weathers—ice making and cold storage plant machinery and equipment.

N. J., Clayton—C. Haegle, (machinist)—one nickel plating outfit with attachments complete.

N. J., Newark—Kraeuter & Co., Inc., 563-585 18th Ave., attention of W. H. Hall, "Hawker" adjustable rod and dowel machine complete with regular equipment, range of cutter head ½-in. to 2-in. diameter.

N. Y., Binghamton—F. E. Harris Co., Stack Bldg.—machinery and equipment for extract factory on Griswold St.

N. Y., Buffalo—Republic Light Heat & Power Co., 173 Winspear Ave.—drilling machinery, cables, etc., for use in extensive drilling operations at Forestville, N. Y.

N. Y., Buffalo—Webb Clean Sweep Co., Inc., 87 Troup St.—machinery for the manufacture of sweepers, brooms, etc.

N. Y., Buffalo—J. Zwelling, 222 Mulberry St.—equipment for sheet metal works.

N. Y., Catskill—The Recorder—flat bed press for power equipment.

N. Y., Endicott—Interstate Limestone Corp., E. E. Kellogg, Little Meadows, Pa., Purch. Agt.—machinery for making concrete blocks and bricks; special forms and shapes for building tiles; mixer and tamper.

N. Y., Forestville, (Chautauqua Co.)—Arkwright Natural Gas Co.—well-drilling machinery, bits, cables, pipe and other miscellaneous equipment for drilling operations.

N. Y., Gouverneur—The Love & Love Co., Barnes St., manufacturer of truck bodies, H. Love, Purch. Agt.—woodworking machinery for the manufacture of automobile truck bodies, also forge and blower.

N. Y., Harrisonville—The Gazette—one 17 column newspaper power press.

N. Y., Margaretville—The News—newspaper power press.

N. Y., Mount Morris—Mount Morris Canning Co.—semi-automatic apple and fruit paring machines, also other canning factory machinery and equipment.

N. Y., New York—Young & Hyde, Produce Exchange Bldg., (contracting engineers)—2 hand power shears, portable, to cut 12 in. beams.

N. Y., Niagara Falls—E. V. Nutting, 449 10th St.—machinery, tools and equipment for plating works.

N. Y., Pike—C. Ellis—cooling machine, 8 x 6 x 10-ft. for market.

N. Y., Pulaski—J. W. Bonney—$1,500 worth of wood working tools and equipment.

N. Y., Rochester—The Rochester Gas & Electric Corp., Clinton Ave., N., J. P. Haftenknapp, Engr.—miscellaneous equipment for proposed liquid gas pumping station.

N. Y., Watertown—The International Burr Corp., 500 Newell St., F. W. Aiken, Purch. Agt.—special machinery for the manufacture of newly patented pulp stone grinding burr.

O., Cleveland—City of Cleveland, c/o Purchasing Dept., is receiving bids until June 1, for 2 industrial trucks and charging apparatus for the new public hall.

O., Cleveland—King Tool Grinding Co.—small machinery and tools.

O., East Columbus—W. C. Hardy & Co., James Pike—concrete block making machinery.

Pa., Phila.—J. B. Connors, 603 East Indiana Ave., (dryers and weavers)—additional machinery for new dye house.

Pa., Phila.—Fay, Kaiser & Sailer Inc., Front and Clearfield Sts., silk and wool manufacturers, L. A. Fay, Mgr.—carders, looms, feeders, drawing frames and other machinery.

Pa., Phila.—The Hensel Colliday Co., 12th and Wood Sts, manufacturer ribbons, silks, etc.—delivery systems, conveyors, chutes, feeders, looms, roving frames, improved twisters, etc

Pa., Phila.—I. J. Horstman Co., 315 Fitzwater St., manufacturer of woolen goods—carders, roving frames, improved twisters, etc.

The Weekly Price Guide

Rise and Fall of Market

Advances—Metals show added demand and prices move up along the list, electrolytic copper now quoted at 14c., lead at 6c., copper sheets at 19.75c., and babbitt metal, fair grade, at 30.80c. Pig iron is quoted from $1 to $4 higher. Brass rods at Cleveland, advance 50c. Old metals show large gains in New York and Cleveland, heavy copper at 1.75c. higher, and tea lead quoted at 4c. Washers advance 50c. to 1.25c. at New York. Castings are firm.

Declines—A leading dealer in shop supplies cuts quotations on machine bolts, lag screws and rivets.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.52
Northern Basic	25.02
Southern Ohio No. 2	22.50
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.56
BIRMINGHAM	
No. 2 Foundry	17.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	26.36
Virginia No. 2	28.34
Basic	23.50@25.50
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	22.50@24.00
No. 2 Foundry, Southern, sil 2.25@2.75	24.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	24.16
Basic	25.00
Bessemer	26.96

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.5	5.0	3.0
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Denver	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2 6
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2 40	3.48	3.15	3.38
No. 12	2.45	3.53	3.20	3.43
No. 14	2.50	3.58	3.25	3.48
No. 16	2.70	3.68	3.35	3.58
Black				
Nos. 17 and 21.	3.00	4.15	3.55	4.10
Nos. 22 and 24.	3.05	4.20	3.60	4.15
Nos. 25 and 26.	3.10	4 25	3.65	4.20
No. 28	3.15	4 35	3.90	4.30
Galvanized steel sheets:				
Nos. 10 and 11.	3.15	4.35	3.75	4.30
Nos. 12 and 14.	3.25	4.45	3.85	4.40
Nos. 17 and 21.	3.55	4.75	4.15	4.70
Nos. 22 and 24.	3.70	4.90	4.45	4.85
No. 26	3.85	5.05	4.60	5.00
No. 28	4.15	5.35	4.90	5.30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	8.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.81	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.70	4.66	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2.58	2.41	2.38
Soft steel bars (base)	2.48	2.31	2.28
Soft steel bar shapes (base)	2.48	2.31	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.58	2.41	2.38
Bar iron (2.00@2.10 at mill)	2.48	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/32	8.00		12@13
1/8	6.50		11@12
5/32 to 1/4	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.00
Tin, 5-ton lots, New York	32.25
Lead (up to carlots), St. Louis, 5.40; New York	6.00
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	6.25	7.50	6.25
Copper sheets, base	19.75	20.00	23.00
Copper wire (carlots)	14@14.50	16.50	16.25
Copper rods (ton lots)	18.25	21.50	19.50
Copper tubing (100-lb. lots)	21.75	23.00	23.00
Brass sheets (100-lb. lots)	16.25	17.50	18.75
Brass tubing (100-lb. lots)	19.00	19.00	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	13.75	15.50	15.75
Brass wire (carlots)	16.25	17.75	.....
Zinc sheets (casks)	8.00	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	
Solder (½ and ½), (caselots)	23.00	22.00	19.00
Babbitt metal (fair grade)	35.00	40.75	36.00
Babbitt metal (commercial)	15.50	15.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.75	10.25
Copper, heavy, and wire	11.00	11.00	9.25
Copper, light, and bottoms	9.50	9.00	8.25
Lead, heavy	4.50	4.50	3.65
Lead, tea	4.00	3.25	3.00
Brass, heavy	6.25	5.00	8.00
Brass, light	5.25	4.50	4.75
No. 1 yellow brass turnings	5.75	5.50	5.00
Zinc	3.00	3.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	\$0.07½@\$0.10	\$0.12	\$0.12
Cotton waste, mixed, per lb.	.055@.09	.09	.09
Wiping cloths per M., 13½x13½	....	50.00	55.00
Wiping cloths per M., 13½x20½	....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb.	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.95	.95	1.04
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00

Coke, prompt furnace, Connellsville...per net ton \$3.25@\$3.50
Coke, prompt foundry, Connellsville...per net ton \$4.25@\$4.75

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–10%	60–10%	60%
1⅛ and 1¼x3 in. up to 12 in.	60%	60-10-10%	60-10%
With cold punched sq. nuts	40%	....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	....	\$4.00 off
Button head bolts, with hex. nuts	30%	\$3.90 net	.....
Hex. head and hex. nut bolts	35%	....	65-5%
Lag screws, coach screws	60–5%	....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	45%	60%	50–5%
Bolt ends, with hot pressed nuts	55%	....	55%
Tap bolts, hex. heads	+10–15%	....	.....
Semi-finished nuts ⅝ and larger	70%	75–5%	80%
Case-hardened nuts	65%	....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	\$5.00	\$3.50	\$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	5.00	3.50	3.50
Washers, round plate, per 100 lb. Off list	5.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.25	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-10%	70%	60-10%
Rivets, tinned	60-10%	70%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	\$3.70	\$3.25	\$3.00
Cone heads, ditto (net)	3.80	3.35	3.10
1¼ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	....	0.15
⅝ in. diameter *EXTRA*	0.15	....	0.15
½ in. diameter *EXTRA*	0.50	....	0.50
1 in. long, and shorter *EXTRA*	0.50	....	0.50
Longer than 5 in. *EXTRA*	0.25	....	0.25
Less than 200 lb. *EXTRA*	0.50	....	0.50
Countersunk heads *EXTRA*	0.35	......	\$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	......

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	\$0.65	\$0.50	\$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40-10-2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40-10%
Second grade	60-10-5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	\$5.84	\$3.85	\$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	....	3.20

Pa., Phila.—The Kaufman Plush Co., Greene Lane and Venice St.—automatic weaving machines, automatic cleaning trunks, revolving flat cards and other machinery.

Pa., Phila.—B. Nason Baking Co., Knorr and Torresdale Ave.—conveyor system and additional baking machinery.

Pa., Phila.—The Phila. Chair Exchange, 6th and Vine Sts., manufacturer of chairs and furniture—one sticker and one large veneer press.

Pa., Sharon—A. Hromyak—air compressor, tools and machinery for small automobile service station.

S. C., Florence—L. Tyler—box making machinery, (new or used).

S. C., Liberty—Beverly Stone & Sand Co., Inc.—belt-driven air compressor, approximately 800-cu. ft., 100 lb. pressure.

Tenn., Knoxville—Duncan Machy. Co., Dempster Bldg., 721 North Central Ave.—one hardwood flooring machine; end matcher for hardwood flooring; 42 in. band re-sawing machine; 800 cu.ft. belt-driven air compressor; 5 to 50 h.p. 60-cycle, 3 phase, 440-volt motors and 100 and 150 h.p., 60-cycle, 3 phase, 2200-volt motors. (Motors rebuilt or used, in good condition.)

Tex., Beaumont—Stedman Fruit Co., E. Stedman, Pres.—two 10 x 10 cold storage machines with connections.

Va., Front Royal—C. A. Ford, flour mill—complete machinery for small flour mill, (new or used).

Va., Lynchburg—Lynchburg Pigments Corp., W. A. Robertson, Secy. and Mgr.—paint grinding machine, (new or used).

Va., Norfolk—Eureka Bottle Mfg. Co., F. F. Priest, Pres.—bottle manufacturing machinery.

Va., Staunton—C. W. Mongold, (manufacturer of lime, brick, etc.)—machinery for grinding lime, (new or used).

Va., Trammel, (Nora P. O.)—The Sutton Lumber Co.—lumber mill machinery and equipment.

Va., West Point—Chesapeake Corp.—W. C. Gouldman, Secry.—$75,000 to $100,000 worth of machinery for manufacture of pulp board and paper specialties.

Va., Wytheville—Gay-Ola Bottling Co., J. L. Porterfield, Secy. and Mgr.—complete line of soda bottling machinery and equipment.

W. Va., Bluefield—Amer. Fruit Co., H. Charlton, Vice Pres. and Genl. Mgr.—machinery for cold storage plant addition.

W. Va., Piedmont—North Branch Coal Co., P. N. Fahey, Secy.—complete line of coal mining machinery.

Wis., Kenosha—Buick Garage, 915 Salem Ave.—gasoline storage tank and pump.

Wis., Kenosha—F. Pietrangeli, 803 Elizabeth St.—equipment for blacksmith shop including forge, drill, grinder.

Wis., Milwaukee—Epstein Bag Co., 615 Cherry St.—special machinery for the manufacture of burlap bags.

Wis., Milwaukee—Lighthouse Superintendent, Federal Bldg., c/o M. M. Works—one stencil cutting machine.

Wis., Milwaukee—Sherman Produce Co., 235 6th St.—ice making machinery, 1 to 2 ton capacity.

Wis., Trippville—H. Wheeler—equipment for proposed blacksmith shop at Glendale.

Alta., Ft. McMurray—The McMurray Asphaltum & Oil Co., Petrolea, Ont., has worked out process for separating oil from the sands, and plans to manufacture special machinery and equipment and develop their lands on a large scale. Receiving bids on separating equipment, pumps, piping and refining equipment. Estimated cost $200,000. T. Draper, c/o owner, Engr.

H. T., Maui, Wailuku—P. W. Eichinger—machinery and equipment for large dairy.

Ont., Beamsville—Culverhouse Bros.—modern equipment for manufacturing jam.

Ont., Dundas—The Crushed Stone Corp.—equipment for crushed stone plant recently destroyed by fire.

Ont., Dunnville—Dominion Fabrics, Ltd.—machinery and equipment for the manufacture of fancy toweling, overdrapes, etc.

Ont., Galt—Newlans Co., Ltd.—special machinery and milling equipment for the manufacture of various grades of plush.

Que., Montreal East—The Hochelage Cement Co., Ltd.—equipment for cement plant.

Ont., Preston—Hurlbut Shoe Co.—shoe making machinery and equipment.

Ont., Smith Falls—International Button Co.—machinery for the manufacture of buttons.

Metal Working Shops

Conn., New Britain—C. D. Ventiano, Church St., has awarded the contract for the construction of a 2 story, working shop, garage and service station, on Church St.

Ind., Ft. Wayne—International Harvester Co. has awarded the contract for the construction of several buildings for the manufacture of motor trucks. D. E. Zimmerman, 611 Chestnut St., Engr.

Md., Port Covington—(Baltimore P. O.)—The Western Maryland Ry., Hillen Sta., has awarded the contract for the construction of locomotive repair shops, here. Cost several hundred thousand dollars. W. C. Byers, Pres.

Mass., Springfield—E. J. Pinney, Inc., 374 Main St., will build a 1 story 100 x 100-ft. garage on Main St. Estimated cost, $40,000.

N. J., Melville—Thompson Machine Co. is having plans prepared for the construction of a 2 story factory—Estimated cost, $150,000. Fletcher-Thompson, Inc., 542 Fairfield Ave., Bridgeport, Conn., Engrs. and Archts.

N. Y., Jamestown—S. B. Robbins, 31 West 5th St., has awarded the contract for the construction of a 2 story, 80 x 80 ft. garage and shop on 4th and Lafayette Sts. Estimated cost, $40,000. Noted Mar. 16.

N. Y., Johnson City—Boland & Bartlett have awarded the contract for the construction of a 1 story, 50 x 150 ft. machine and repair shop. Estimated cost, $20,000.

N. Y., New York—L. Gold, 2 Rector St., will build a 1 story garage on Columbus Ave. between 204th and 205th Sts. Estimated cost, $175,000.

N. Y., New York—Niewenhous Co., 316 East 161st St., will build a 21 story, 60 x 85 ft. garage on 3rd Ave. and 160th St. Estimated cost, $40,000.

N. Y., New York—T. F. T. Realty Co., c/o Seelig & Finkelstein, Archts., 44 Court St., Brooklyn, will build a 1 story garage on East 3rd St. Estimated cost, $75,000.

N. Y., New York—H. Weprin, c/o V. Mayper, Archt., 156 40th St., is having plans prepared for the construction of a 2 story, 100 x 100 ft. garage at 412 East 55th St. Estimated cost, $50,000.

O., Cleveland—D. S. Blossom, c/o A. Garfield, Archt., Natl. City Bldg., has awarded the contract for the construction of a 2 story garage and service station on Richmond Rd. Estimated cost $50,000.

O., Cleveland—The Champion Rivet Co., East 108th St. and Harvard Ave., plans to build a 1 story factory addition on Dunham Rd. Estimated cost $50,000. D. J. Champion, Pres. Architect not selected.

O., Cleveland—The Natl. Bronze & Aluminum Co., East 88th St. and Laisey Ave., has awarded the contract for the construction of a 1 story, 20 x 150-ft.. addition to its factory on East 88th St. and Laisey Ave. Estimated cost $40,000. Private plans.

O., Cleveland—The Stone Improvement Co., Kirby Bldg., has awarded the contract for the construction of a 1 story 42 x 149 ft. garage on East 83rd St. and Carnegie Ave. Estimated cost $45,000.

O., Cleveland—G. W. Walters Transfer Co., 476 East 115th St., is having plans prepared for the construction of a 1 story, 50 x 80 ft. garage and warehouse at 887 East 140th St. Estimated cost $40,000. Private plans.

O., Massillon—W. E. Wagner has awarded the contract for the construction of a 2 story, 48 x 105 ft. garage. Estimated cost $50,000. Noted March 23.

Pa., Grove City—The Bessemer Gas Engine Co. plans to construct a large addition to its plant on Lincoln Ave. Estimated cost to exceed $25,000.

Pa., Phila.—A. W. Barnes, Archt., 10 South 18th St., is receiving bids for the construction of a 1 story, 94 x 180-ft., garage on Bellfield Ave. and Courtland St., for S. H. Marvel, 1607 Hunting Park Ave. Estimated cost $50,000.

Pa., Phila.—The Richter Machine Co., Van Kirk Ave., has awarded the contract for the construction of a 1 story, 50 x 100-ft., machine shop on Erdwick and Van Kirk Aves. Estimated cost $7,000. Private plans.

Pa., Reading—Reading Casting Co. plans to rebuild its casting factory, which was destroyed by fire. Estimated cost, $40,000.

R. I., Anthony—The Coventry Co. has awarded the contract for the construction of a 2 story, 60 x 100 ft. machine shop addition.

Tenn., Chattanooga—The Somerville Iron Wks. has awarded the contract for the construction of an addition to its plant. Estimated cost $750,000.

Wis., Glendale—H. Wheeler, Trippville, plans to build a 1 story 75 x 80 ft. blacksmith and repair shop, here. Estimated cost $40,000. Architect not selected.

Wis., Kenosha—Buick Garage, 915 Salem Ave., is receiving bids for the construction of a 1 story 50 x 125-ft. addition. Estimated cost, $40,000. Private plans.

Wis., Madison—The Bd. Educ. plans to construct a 1 and 2 story, 75 x 80 ft., manual arts shop, including shops for machine work, woodworking, etc., on 5th St. Estimated cost 55,000. Architect not selected.

Wis., Plymouth—The Central Garage plans to construct a 1 story, 54 x 120-ft. garage and repair shop on Division St. Estimated cost $50,000. Architect not selected.

Wis., Racine—The Walker Mfg. Co., Hamilton and Michigan Sts., has awarded the contract for the construction of a 1 story, 60 x 98 ft. addition to its auto accessory factory on Hamilton St. Estimated cost $9,000. Private plans.

Ont., Kingston—T. Watson Co., Ltd., is building a 70 x 100 ft. foundry and plans the erection of 4 other units. Estimated cost, $40,000.

Ont., Kitchener—R. Kleinschmidt, Frederick St., plans to build a garage and repair shop. Estimated cost $40,000.

General Manufacturing

Cal., Visalia—The California Packing Corp., 101 California St., San Francisco, is receiving bids for the construction of a 1 story, warehouse addition to its packing plant here. Estimated cost $20,000. P. Bush, 101 California St., San Francisco, Engr.

Conn., Hartford—The Fuller Brush Co., 547 Asylum St., has awarded the contract for the construction of a 4 story, 80 x 400 ft. plant with 80 x 100 ft. ell, also 120 ton coal pocket, on Windsor Ave. Estimated cost, $500,000. Noted April 6.

Cal., Hanford—The Hanford Ice Co., West 6th St., has awarded the contract for the construction of a 60 ton ice plant on Phillips St.

Cal., San Jose—The Security Warehouse & Cold Storage Co., 350 North 1st St., has awarded the contract for the construction of a refrigerating plant on North 1st St. Estimated cost $23,000. Private plans.

Ind., Indianapolis—Goodman & Co., 615 North Noble St., is having plans prepared for the construction of a 1 story, 100 x 190 ft. hosiery factory on North Noble St. Estimated cost $30,000. Lockwood-Green & Co., 38 South Dearborn St., Chicago, Engrs.

Ind., Indianapolis—C. E. Pauley & Co., 112 East Maryland St., has awarded the contract for the construction of a 5 story, 95 x 135 ft., printing plant on North New Jersey St. Estimated cost $225,000.

Mich., Detroit—The Curtis Co., Lafayette Blvd., has awarded the contract for the construction of a 2 and 3 story printing plant and office building on West Grand and Hamilton Blvds. Estimated cost $125,000.

N. J., Trenton—McCrillish Quigley Co., State St., has awarded the contract for the construction of a 3 story, 60 x 100-ft. printing plant on Wood St. Estimated cost, $75,000.

N. Y., Buffalo—Webb Clean Sweep Co., Inc., 87 Troup St., is receiving bids for the construction of a 40 x 48-ft. sweeper factory on Troup St. Estimated cost $5,000. Architect not announced.

N. Y., Newark—Phillips-Werth Optical Co. plans to build a 55 x 175 ft. optical factory on Willow Ave. and Main St. Cost to exceed $35,000. Architect not announced.

N. Y., New York—The New York Wet Wash Co., 732 East 144th St., has awarded the contract for the construction of a 3 story laundry on Concord Ave. and 144th St. Estimated cost $100,000.

O., Cleveland—Lockwood Greene & Co., Engrs., Hanna Bldg., is receiving bids for the construction of a 4 story, 80 x 140 ft., factory on East 40th St. along the tracks of the New York Central R.R., for Billings-Chapin Co., 1163 East 40th St., paint manufacturer. Estimated cost $200,000. Noted Nov. 24.

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Methods of Machine Tool Design—A. L. DeLeeuw

The articles listed above are to appear in the next issue.

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WHO'S WHO

Mr. Silas Torrey Massey

Mr. S. T. Massey, sales manager of the Heald Machine Company, was born in Brownville, N. Y. on November 18th, 1882. He was graduated from the Syracuse University with the degree of Mechanical Engineer in 1906.

His first job was in the shop of the New York Air Brake Company of Watertown, N. Y. He later went with the Buffalo Forge Company in the export sales department. He remained with them two years and then connected with the Taylor-Wharton Iron and Steel Company of High Bridge, N. J. Two years later, he left to become assistant sales manager of the Titan Steel Casting Company. In 1912 he went with the Heald Machine Company and in 1913 became sales manager.

He is a member of the Worcester Advertising Club, the Commonwealth Club, Delta Upsilon and is a Mason.

He is an agriculturist—he makes his money in the machine tool business and spends it on the farm. What he has left he spends in automobiling.

American Machinist

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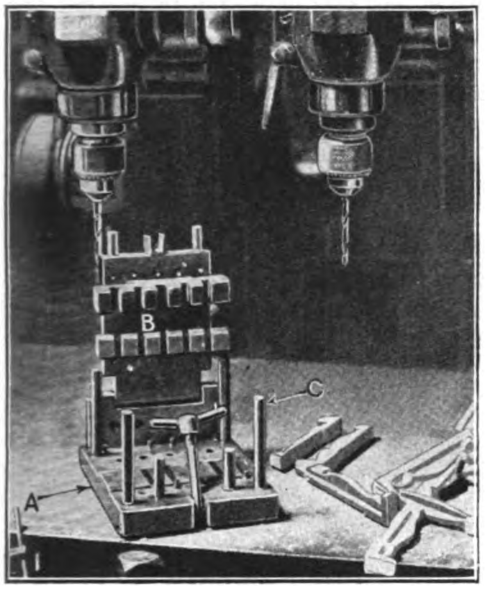
Methods in a Radio Shop

Some Devices That Have Been Developed To Handle Small Parts Used in Radio Apparatus —Jigs, Fixtures and a Magazine Feed for an Engraving Machine

BY FRED. H. COLVIN
Editor, *American Machinist*

THE devices illustrated herewith have been developed by the Acme Apparatus Co., Cambridge, Mass., for the rapid handling of small parts used in radio apparatus. A drilling jig for transformer frames is shown in Fig. 1. Five of the side bars shown piled on the bench are held between the pins shown in the baseplate *A*. The lid *B* is closed over the bars and is clamped by the screw shown. The bushings are carried in the plate and the jig is then turned upside down, resting on the feet *C*, so that the holes are all drilled from the flat sides of the bars. These bars are of aluminum and it is, of course, necessary to clean the jig between each loading, so as to insure the next pieces fitting evenly on the plate *A*. The operator found that by dipping the empty jig in a pail of gasoline, the chips were removed instantly.



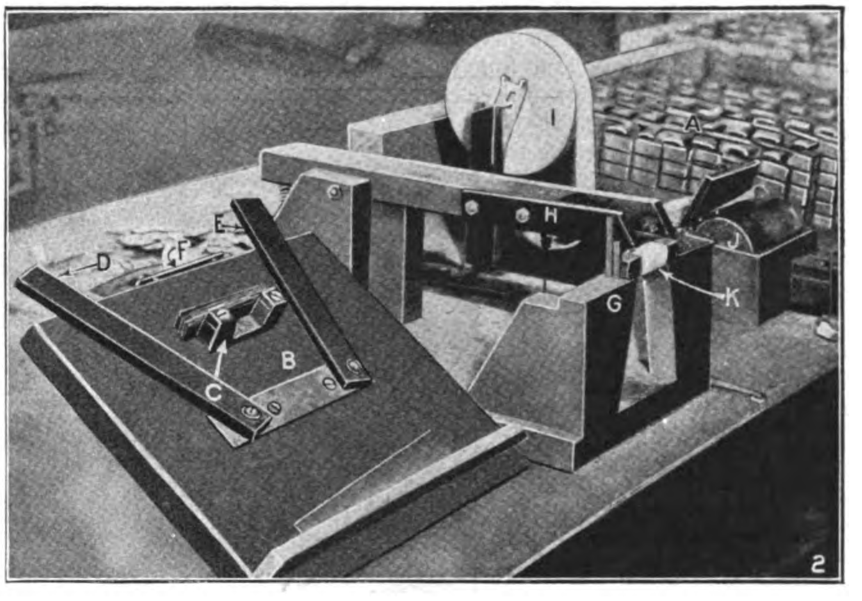


FIG. 1—DRILLING THE TRANSFORMER FRAME. FIG. 2.—ASSEMBLING KEEPERS FOR TRANSFORMER CORES

The cores for the transformers consist of a stack of U-shaped stampings, some of the assembled ones being shown at *A* in Fig. 2. The flat keepers that are placed over the ends of the cores are assembled in the fixture

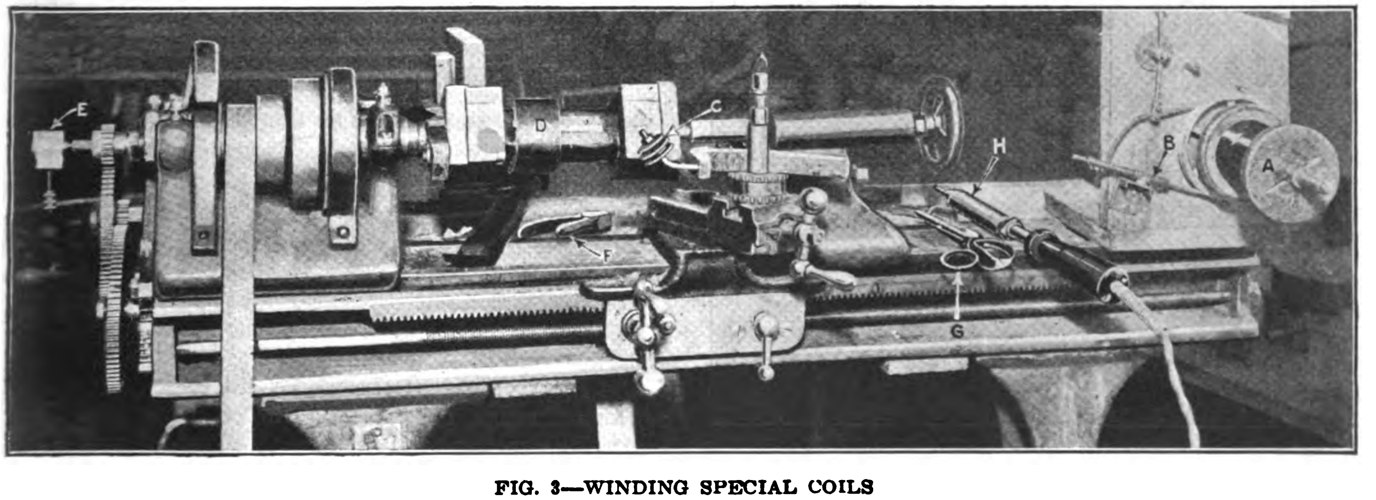


FIG. 3—WINDING SPECIAL COILS

shown at *B*. The required number of strips are laid on the two-pronged block, as at *C*, and the two arms *D* and *E* are brought together until they stop against the

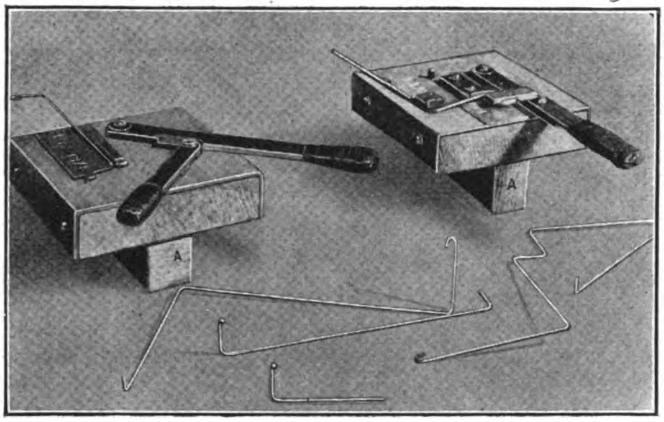


FIG. 4—BENDING FIXTURES FOR CONNECTING WIRES

ends of the plate *F* which indicates that the strips are in a central position. The package is then picked up by placing the thumb and finger between the prongs and placed in the binding fixture *G* while the arm *H* is brought down by a treadle to hold it in place until it is secured by the insulating paper. This paper is carried on the roll *I* and is threaded through the moistener at *J*. A sufficient length is torn off and wrapped around the center of the stack of strips at *K*. It will be noted that the open construction of the frame *G* and the arm *H* makes it easy to bind the strips.

An idea of some of the special windings required, and the method of doing the work may be had from Fig. 3. The lathe is fitted with a special chuck for holding the cores to be wound. The wire comes from the spool *A* which is kept under the proper tension by the spring controlled brake *B*. The wire is fed around the grooved roller *C* and onto the cores as at *D*. The counter *E* enables the operator to keep track of the number of turns in the coil, which is very important in this work. The wire cutter *F*, the shears *G* and the electric soldering iron *H* complete the necessary paraphernalia for this work.

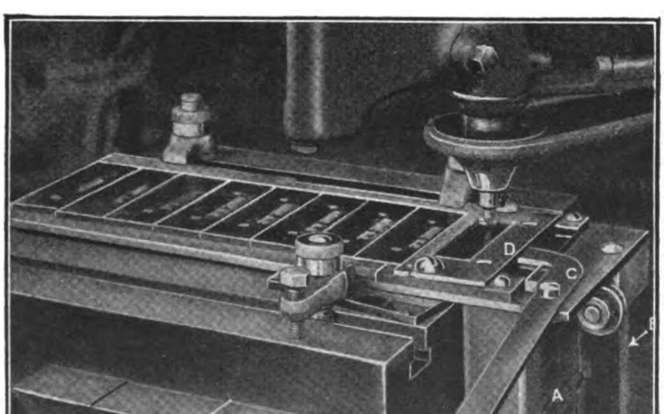


FIG. 5—A MAGAZINE FEED FOR AN ENGRAVING MACHINE

Simple Bending Forms

Simple fixtures for bending some of the various connecting wires are shown in Fig. 4. They are made up of wooden blocks designed to be easily clamped in a vise by the tongues *A*, and are provided with sheet metal faces on which are mounted various bending levers and forms, as shown. The fixtures shown are only two of many different fixtures of this kind. Some of the wires bent to various shapes may be seen on the bench in front of the fixtures.

The device shown in Fig. 5 is a magazine feed for a Gorton engraving machine. The plates to be engraved are of standard insulating material and are stacked in the magazine at *A* and fed upward by the weighted chain *B*. The lever *C*, when in the position shown in the illustration, acts as a stop to prevent the upward feed of the pieces in the magazine. When it is moved from the stop position, it allows the pieces to rise,

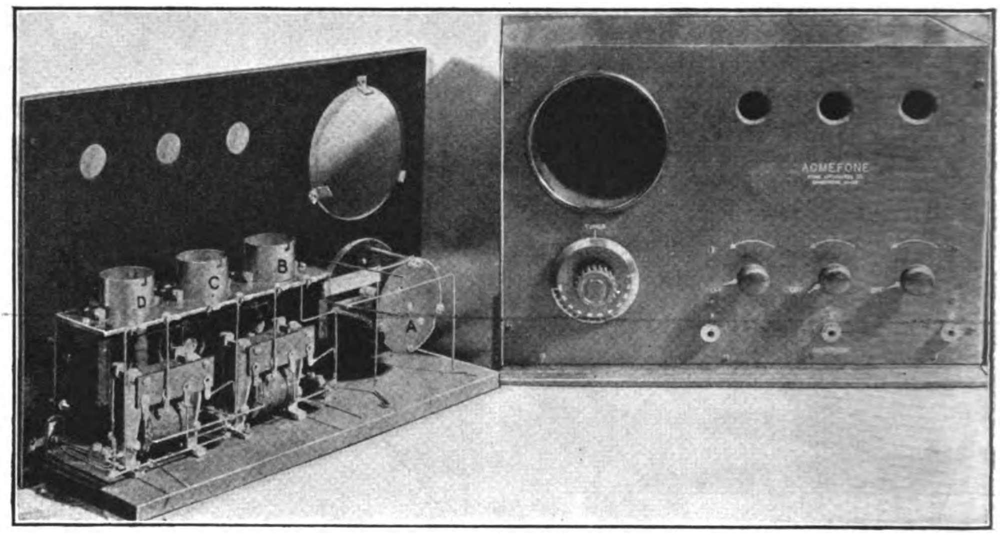


FIG. 6—COMPLETE APPARATUS AND ASSEMBLY

and when moved back to the stop position it pushes the top piece under the plate *D* and brings it into position so that the engraving will be done in the proper location and also pushes the last piece engraved from under the plate *D* and to the left away from the magazine. When the table is full of pieces that have been engraved each successive motion of the lever *C* pushes off the piece at the extreme left of the table from where it drops into a chute leading to a receptacle.

The Assembled Apparatus

Some idea of the appearance of the assembled apparatus is given in Fig. 6. The completed transformers are shown in place at the left, together with some of the connecting wires and the manner in which the parts go together. This is a complete little unit, comprising a variable condenser tuner at *A*, an audion tube detector socket at *B* and sockets for amplifying bulbs at *C* and *D*. The front of the complete box, shown at the right, is one of the pieces fed to the engraving machine through the magazine described above. The engraving consists of lettering and arrows showing the direction in which to turn the various control knobs.

Estimating Modern Gear Production

Charts and a Slide Rule That Make Estimating Easy—Use of Disk Cutters and Hobs—Extra Travel of Cutters—Examples of Estimate Sheets

By GUSTAVE E. SPIES
Estimator, Gould & Eberhardt

THE increased productivity obtained from modern machines has created a demand for a means to easily and accurately calculate such production.

An estimating operation should be applicable to a given set of operating conditions, the method being such that the required result is obtained by means of purely mechanical operations on the part of the person doing the estimating, necessitating little or no mental effect.

A series of charts has been developed in the factory of Gould & Eberhardt, Newark, N. J., for rapidly and accurately calculating the rate of production on gear cutting machines. The charts, which are presented herewith and fully described, are especially adapted for both the hobbing and disk-cutter type machines manufactured by Gould & Eberhardt. A slide rule for the same purpose is also shown and described which has various advantages over the charts mentioned, particularly in expediting the calculations.

Many factors affect the accurate calculation of gear production, each of which must be given careful consideration. The chief factor is the proper selection of the most suitable method, type of machine for the required output, style, finish and accuracy of the gear. Knowing this the following factors, relative to machining, are then to be considered.

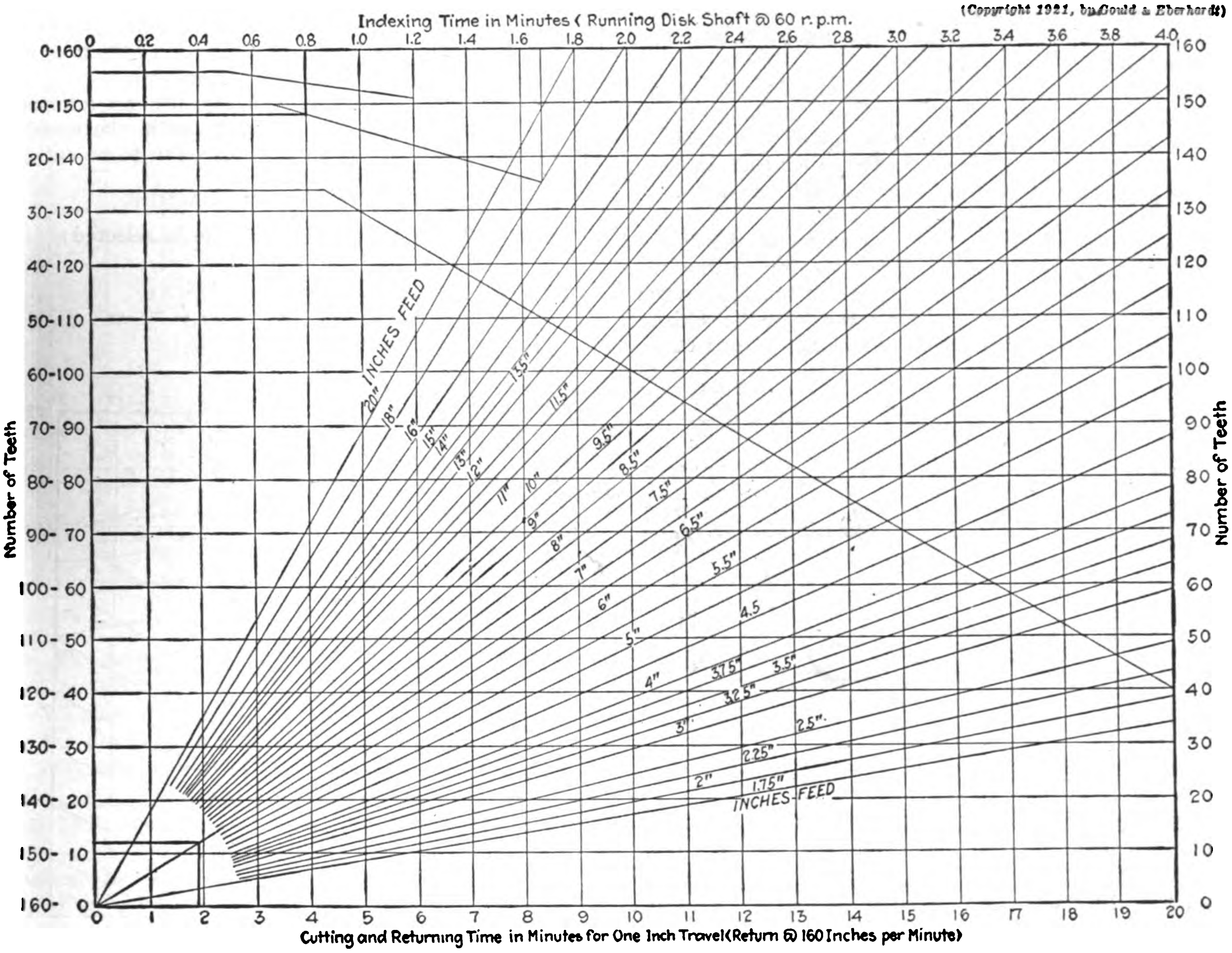


FIG. 1. CHART FOR DISK-CUTTER TYPE MACHINES

Using Disk Cutters

First—When a disk-cutter type machine is selected:

A, Style of cutters.
B, Work support
C, Feed and return of cutter
D, Indexing of blank.

A. Cutters are of great importance in obtaining the best results. Great care should be taken in their selection and consideration should be given to the following items:

Whether the quality required is such that roughing

and finishing cutters are necessary.

Whether the quality required will permit finishing in one cut.

Whether two or more teeth can be finished simultaneously.

Whether one tooth can be finished with a roughing and finishing cutter in gang.

For roughing gears of 3-pitch and finer, cutters with right and left rake and hooked cutting faces can be used to advantage both singly and in gangs. When used in gangs, the cutters should be arranged in herring-bone style, that is, the inner edges of the cutting teeth on the two cutters should cut simultaneously and then the outer edges of the succeeding teeth and so on alternately, thereby counteracting any oscillating effect of the gear being cut, due to the alternate action of the cutters.

Gang cutters with right and left rake, but with radial cutting edges have been used for finishing several teeth in the gear blanks where quality was not of prime consideration. It is to be noted that in using these cutters the cutting edge should be radial and not hooked, as in the roughing cutter.

For coarser pitches a roughing cutter of the stepped type with hooked faces, and a finishing cutter with radial faces can be used in gangs for finishing a gear in one cut. The finer pitches can also be finished, with a finishing cutter radially ground, in one cut.

For the highest class of gears, it is advisable to rough out the gear with a single or gang roughing cutter, and then finish it in a separate operation with a radially ground finishing cutter.

B. The work support should be of very rigid design so as to eliminate the tendency for the machine to chatter. It has been found that the work support is a very important factor, in both output and finish of gear cutting machines. The elimination of chatter also increases the life of the cutter, by reducing the number of sharpenings of the cutting edge to a minimum.

C. The feed of the cutter in inches per minute must be selected with particular regard to the quality of finish desired and to maintain the proper form of tooth. The kind of material to be cut also controls the feed as well as the style of cutter used. The return of the cutter is an automatic operation which is constant and is figured in inches per minute.

D. The indexing of the blank is also an automatic operation and is constant for each tooth, the speed of which depends upon the number of teeth to be cut.

Work on a Hobbing Machine

Second—When a hobbing machine is selected:

A, Hob
B, Work support
C, Hob speed
D, Hob feed.

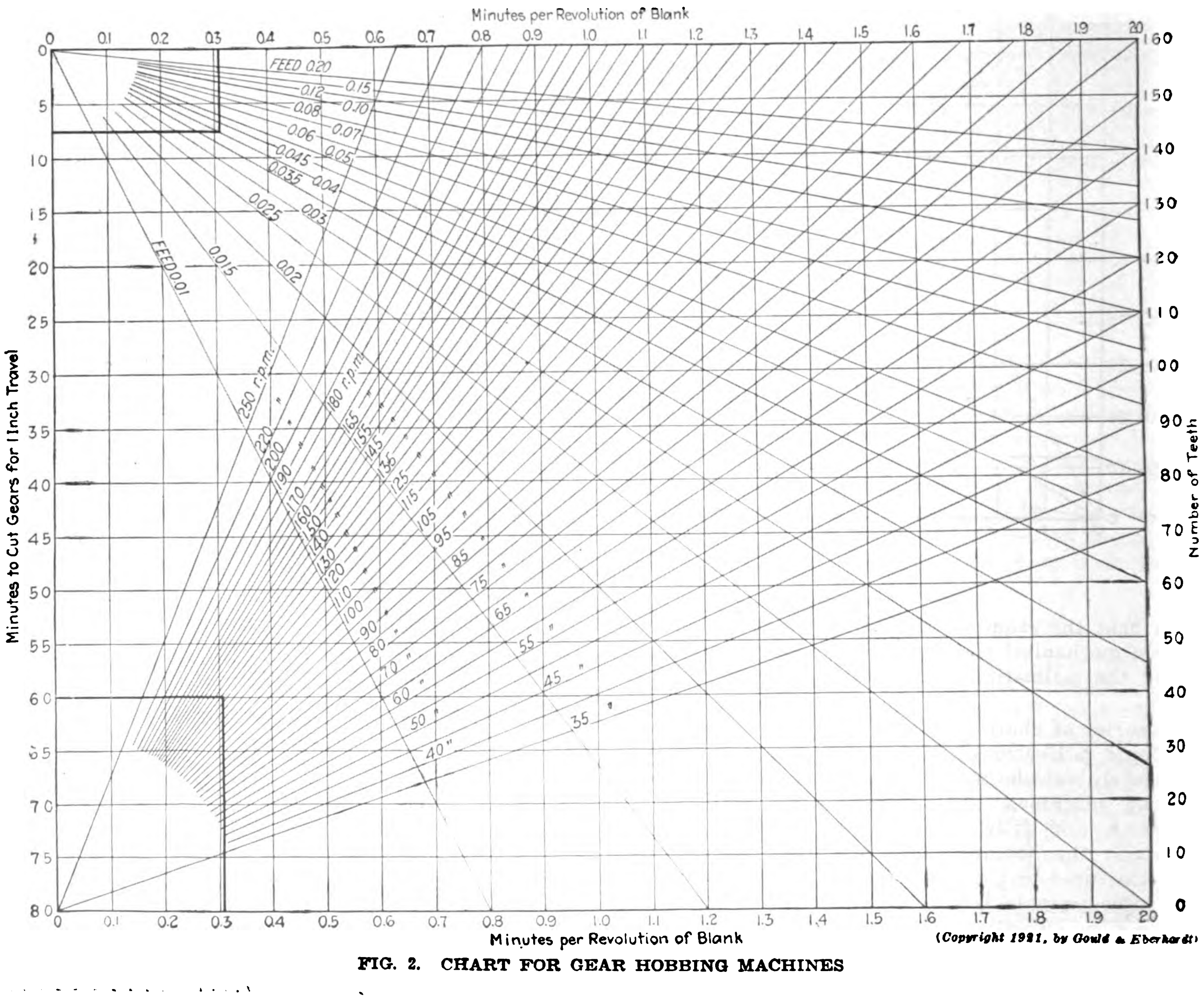


FIG. 2. CHART FOR GEAR HOBBING MACHINES

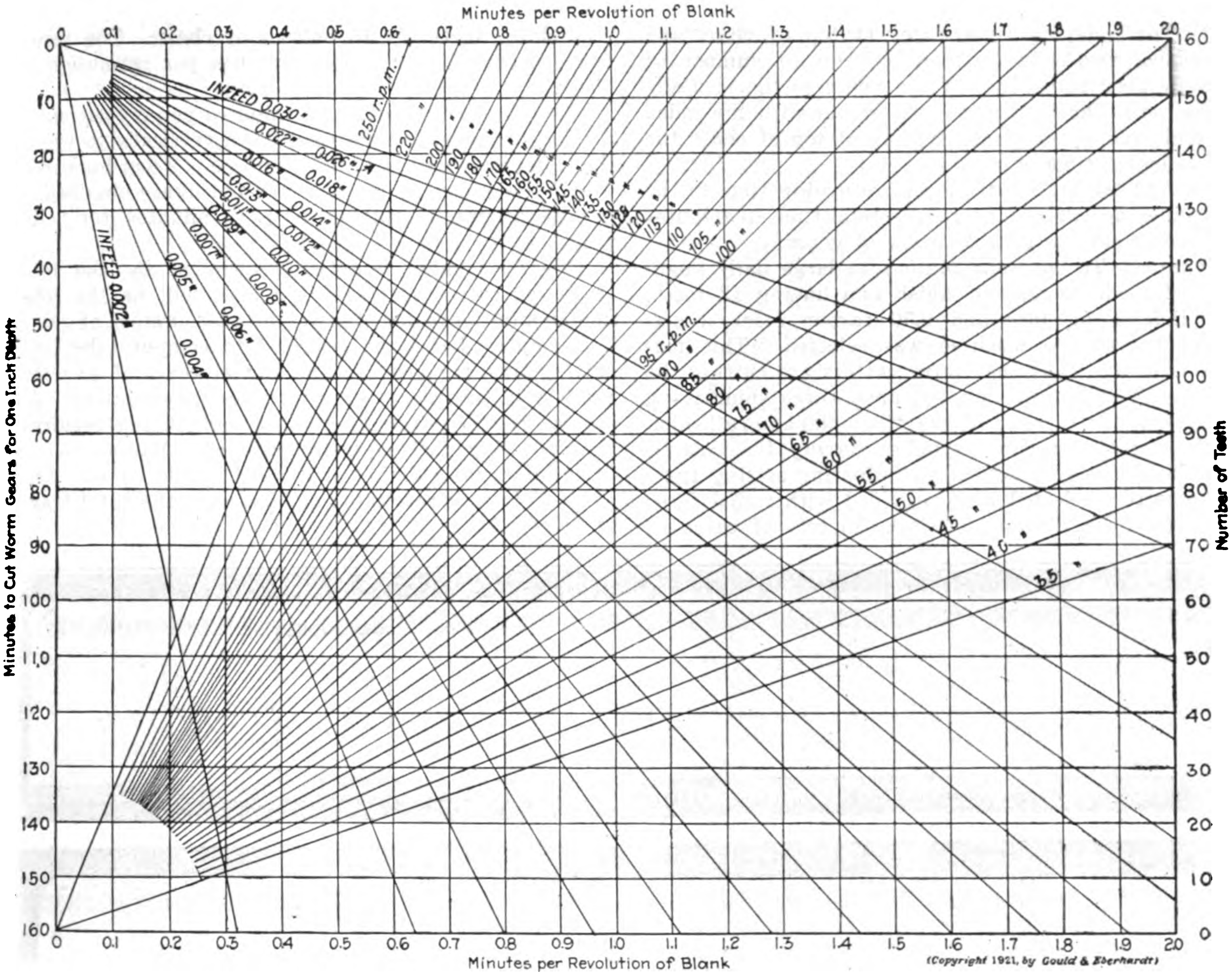


FIG. 3. CHART FOR WORM-WHEEL HOBBING MACHINES

A. The selection of the hob rests upon the following considerations:

> Whether a roughing and finishing hob is to be used.
> Whether or not the quality of finish is such that only one cut need be taken.

It has also been found advantageous, when roughing with hobs that they be made with hooked cutting faces, instead of radial cutting faces. Also that the roughing hob must be made thinner than the finishing hob. For accurately forming the teeth a radially ground hob should be used.

For commercial purposes spur gears and helical gears can be finished in one cut. For gears of higher quality it is generally advisable in cases of 3-pitch and coarser to take two cuts, one roughing and one finishing.

B. The work support must be of still more rigid design than that used on disk-cutter machines. The rim of the blank must be supported near the periphery. Very substantial clamping means should be applied because of a certain amount of tangential pressure that is put on the gear while being cut. When cutting helical gears of extreme angles it is often advisable to have keyways in the gear and in the work arbor.

C. The speed in feet per minute of the hob depends entirely upon the material to be cut and the number of sharpenings determined upon as being the most economical for a given period of time or output.

In hobbing gears, the speed of the hob, or rather its revolutions are an important factor in the output. In this respect hobbing is distinguishable from disk cutting, in which the revolutions of the cutter do not directly effect the output.

D. The feed of the hob in inches per revolution of the gear blank depends upon the finish required. It is not greatly affected by the material to be cut.

The practice as outlined, having been carefully considered, the next step is to determine the limitations of the machine, that is to say the number of blanks which can be stacked, having due regard for the fact that the blanks should be removed without disturbing centers. The estimator is then ready to proceed with the actual calculation of the output.

Jsing Chart for Disk Cutter Estimating

In Fig. 1 is illustrated a rectilinear chart especially designed for gear cutting machines of the disk cutter type. The factors having been determined as outlined, this chart is used as follows:

(1) Enter at the origin of chart and read up vertically on the tooth column to number of teeth in gear to be cut. From there go horizontally on the tooth line to where it intersects with the selected feed line, and read down vertically finding at bottom of chart the cutting and returning time of gear for 1 in. travel.

(2) Multiply this number by the total travel of cutter, and the product or result is total cutting and returning time, in minutes.

(3) For indexing time, enter at top of chart and read down vertically on tooth column to number of teeth in gear to be cut. From there go horizontally on the tooth line to where it intersects with the index line and read up vertically finding at top of chart the total indexing time in minutes.

(4) Add the total cutting and returning time to the total indexing time. The sum is total time in minutes required to cut the gear or stack of gears.

Example: To cut spur pinions in large daily quantities of medium class of finish and having 12 teeth, 3-4 pitch, 4 in. face and 0.50 carbon steel, a six-spindle turret-type machine was selected. This machine is so arranged that three cutters are cutting the teeth in three blanks mounted upon three spindles on one side of the turret. Three other blanks are loaded on the remaining three spindles during the cutting operation, thereby practically eliminating setting time.

The cutters selected were provided with radial faces and alternate right and left rake in sets of three of uniform diameter. The feed of cutter carriage per minute selected was 6.5 in. The total travel of cutter in this case is 5¾ in. using cutters of 4¾ in. diameter and having an extra travel of 1¾ in.

(The extra travel for cutters and hobs can be readily obtained from Fig. 5 which also indicates proper diameters for the various pitches.)

(1) Cutting and returning time in minutes for 1 in. travel (return at 160 in. per minute) = 1.95 min.

(2) 1.95 min. x 5¾ in. total travel = 11.03 min.

(3) Indexing time for 12 teeth = 0.8 min.

(4) Total cutting time 11.83 min.

The total time, 11.83 min., is for three pinions to which is added setting time of 0.5 min. for rotating turret and starting cut on three other blanks.

In Fig. 2 is shown a rectilinear chart adapted for spur and helical gear hobbing-machines. The factors having been determined as outlined above, the chart is used in the following manner:

(1) Enter at the origin of chart and read up vertically on tooth column to the number of teeth in gear to be cut. Then read over horizontally on tooth line to where it intersects with r.p.m. line (speed of hob) and read down vertically to bottom of chart. The result found there will be time in minutes per revolution of blank.

(2) Find at top of chart minutes per revolution of blanks just obtained and read down vertically to where this intersects with selected feed line. From here read over horizontally to left of chart and figure obtained in minute column is cutting time in minutes for 1 in. travel.

(3) The above quantity multiplied by the total travel of cutter carriage in inches will be the total time in minutes required to cut the gear or stack of gears.

Example: Let it be required to compute the total cutting time per gear, for mild steel gears of 40 teeth, 8 pitch, 1¼ in. face, stacking six gears per setting. An accurately cut and finely finished tooth being required, the following factors were assumed. Radial hob of 2⅞ in. diameter running at a speed of 130 r.p.m. Feed of 0.040 in. per revolution of blank and the total travel of hob 8½ in.

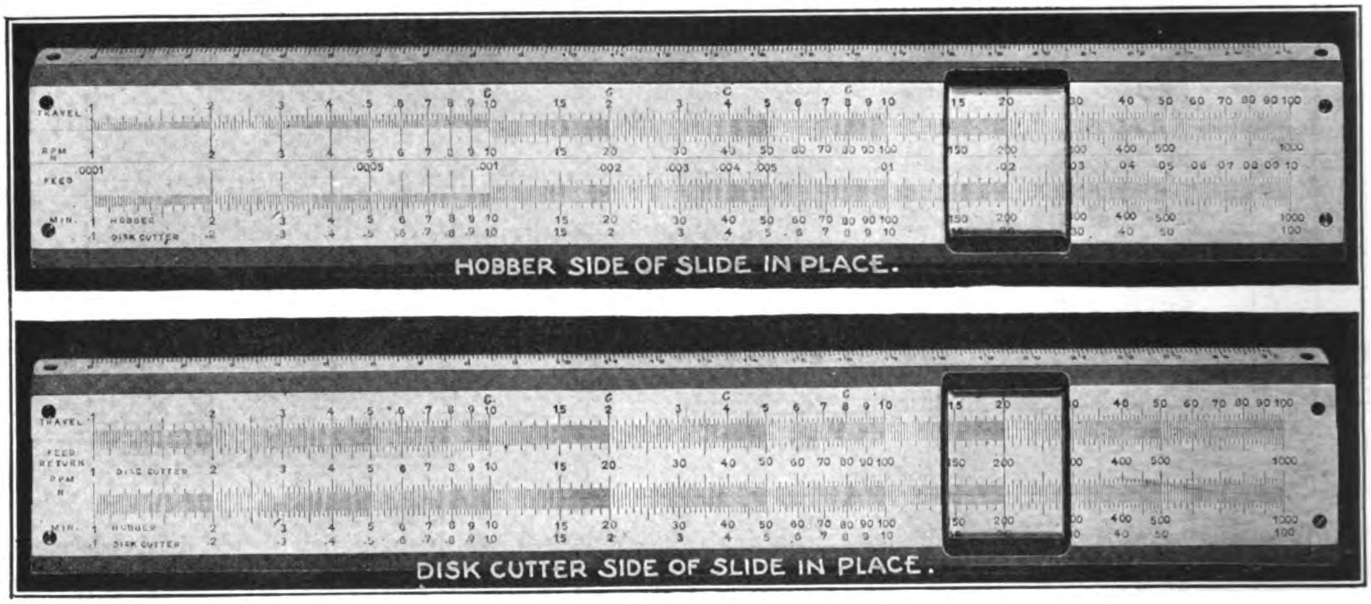


FIG. 4. SLIDE RULE FOR HOBBING AND DISK-CUTTER TYPE MACHINES

The following results were obtained by using the chart:

(1) Time per revolution of blank = 0.31 min.

(2) Time for 1 in. travel = 7.7 min.

(3) 7.7 min. per inch x 8½ in. total travel = 65.4 min. = cutting time for six gears.

In Fig. 3 is shown a chart used for computing the necessary time to hob worm wheels by the "infeeding" method. As this chart is analogous to the hobbing chart just described, its use need not be explained in detail.

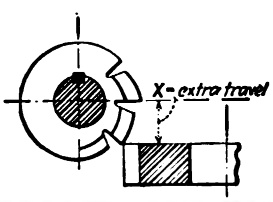
Charts similar to those shown in Figs. 2 and 3 can be prepared for calculating output on worm-wheel hobbing machines equipped with tangential feed. Different feed values in this case must be substituted for the feed values shown in Fig. 2. These values depend upon whether a tangential feeding hob or a fly tool is used. For the latter, smaller feed values are inserted. The method of using this chart is identical with that described in spur and helical gear hobbing.

In Fig. 4 is illustrated a slide rule developed by the writer for computing the problems solved by the charts just described. This slide rule being less cumbersome and combining in one instrument the essential elements of several charts, is far superior for quick work. In

common with other slide rules it consists substantially of a body with a slide and runner. All the scales on this rule, including the reverse side of slide, are graduated logarithmically with three cycles between the indexes. The slide as illustrated has two sides graduated, one for hobbing and the other for disk-cutting time computations. The four gage points marked C on travel scale represent constants which vary according to the number of teeth being cut on a disk cutter machine. They indicate the number of revolutions made by the disk shaft in indexing one tooth. Their use will be explained later. The scales have certain markings which are thus explained.

Travel = Total travel of hob or cutter.

The scale marked "MIN." has two values, an upper and a lower. The upper value indicates in minutes the total cutting time for hobbing, and the lower value has a triple significance, namely, cutting time in minutes, total returning time in minutes, and total indexing time in minutes for a disk cutting machine.



CUTTERS									HOBS						
HOLE	1 1/4		1 1/2 •		1 1/2		2 •		HOLE	1 1/4		1 1/2		2	
KEYWAY	3/16 x 3/32		3/8 x 3/16		3/8 x 3/16		1/2 x 3/16		KEYWAY	3/16 x 3/32		3/8 x 3/16		1/2 x 1/4	
PITCH	DIAM.	X	DIAM.	X	DIAM.	X	DIAM.	X	PITCH	DIAM.	X	DIAM.	X	DIAM.	X
1 1/2					7 1/4	3 1/8			1 1/2					7 1/2	3 1/2
1 3/4					6 3/4	2 7/8			1 3/4					7 1/4	3 1/8
2					6 1/4	2 5/8			2			5 3/4	2 1/2		
2 1/4					6 1/4	2 1/2			2 1/4			5 1/4	2 1/4		
2 1/2					6 1/4	2 3/8	5 3/4	2 1/4	2 1/2			5	2 1/8		
2 3/4					6 1/4	2 1/4	5 3/4	2 1/8	2 1/4			4 3/4	2		
3	4 3/4	1 7/8			5 1/4	2	5 3/4	2 1/16	3	4 1/2	1 7/8				
3-4	4 3/4	1 3/4	4 3/4	1 3/4	5 1/4	1 15/16	5 3/4	1 15/16	3 1/2	4 1/8	1 5/8				
3 1/2	4	1 3/4	4 3/4	1 15/16	5 1/4	1 7/8	5 1/2	1 15/16	4	3 7/8	1 1/2				
4	4	1 5/8	4 3/8	1 11/16	5 1/4	1 13/16	5 1/4	1 13/16	3-4	3 7/8	1 1/2				
4-5	4	1 7/16	4 3/8	1 1/2	5 1/4	1 5/8	5 1/4	1 5/8	5	3 1/2	1 3/8				
5	3 1/2	1 3/8	4 1/4	1 1/2	5 1/4	1 5/8	5 1/8	1 5/8	4-5	3 1/2	1 3/8				
5-7	3 1/2	1 5/16	4 1/4	1 5/16	5 1/4	1 3/8	5 1/8	1 3/8	6	3 1/4	1 1/4				
6	3 1/2	1 1/4	4 1/4	1 3/8	4 1/4	1 3/8	5 1/8	1 1/2	7	3	1 1/16				
6-8	3 1/2	1 1/8	4 1/4	1 1/4	4 1/4	1 5/16	5 1/8	1 3/8	5-7	3	1 1/16				
7	3 1/2	1 3/16	4	1 1/4	4 1/4	1 5/16	4 7/8	1 5/16	8	2 7/8	1				
7-9	3 1/2	1 1/16	4	1 1/8	4 1/4	1 1/8	4 7/8	1 3/16	6-8	2 7/8	1				
8	3 1/2	1 1/8	4	1 3/16	4 1/4	1 3/16	4 7/8	1 1/4	9	2 3/4	15/16				
8-10	3 1/2	1	4	1 1/8	4 1/4	1 1/16	4 7/8	1 3/16	7-9	2 3/4	15/16				
9	3 1/2	1 1/16	3 7/8	1 1/8	4 1/4	1 1/8	4 3/4	1 3/16	10	2 3/4	15/16				
10	3 1/2	1	3 7/8	1 1/16	4 1/4	1 1/16	4 3/4	1 1/8	8-10	2 3/4	15/16				
12	3 1/2	7/8	3 3/4	15/16	4 1/4	1	4 5/8	1 1/16	12	2 1/2	7/8				
14									14	2 1/2	3/4				

• *Special cutters for multiple spindle machines*

FIG. 5. TABLE OF EXTRA TRAVEL FOR CUTTERS

Scale Markings on Hobber Side

On the side of the slide marked Hobber the scale markings denote the following:

r.p.m. = Revolutions per minute of hob

N = Number of teeth in gear to be cut

Feed = Vertical feed for spur or helical gears and tangential or infeed for worm wheels per revolution of blank.

On the side of the slide marked Disk Cutter the scale markings indicate the following:

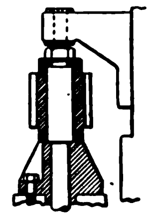
Feed = Feed of cutter in inches per minute

Return = Return of cutter in inches per minute

N = Number of teeth in gear to be cut

DRAWING NUMBER AM-10	PART NAME Pinion		DATE 10-10-21	NUMBER 2708
NUMBER TEETH 12	PITCH 3-4	FACE 4"	AGENT J. P. Jones Mach. Co.	
STYLE Spur	MATERIAL 0.50 Carbon Steel		CUSTOMER Smith Tractor Co.	
FEED 6.5"	SPEED 100 Ft.		MACHINE No. 36 S.T. (3 Spindles Cutting) (3 Spindles Loading)	

FIXTURES



CUTTER				TIME	
DIAM.	HOLE	KEYWAY	WIDTH	CUTTING	SETTING
4 1/2"	1 1/2"	3/8" x 3/16"	0.96	11.8 min	0.5 min.
Use cutters with R. and L. rake				TOTAL	EACH
and radial edge.				12.3 min.	4.1 min.
In sets of three					
REMARKS				OUTPUT PER HOUR AT 80 PER CENT EFFICIENCY	OUTPUT PER HOUR OF 8 HOURS
Use 3 spindles, 1 gear each				11.7 gears	93.6 gears
Total 3 gears				NUMBER MACHINES REQUIRED TO CUT GEARS PER DAY	
Finish 1 cut					

FIG. 6. ESTIMATE SHEET FOR GEARS CUT WITH DISK CUTTERS

r.p.m. = Revolutions per minute of disk shaft for indexing.

The table below denotes the constants C to be used for different numbers of teeth.

N	C
4 — 9	8
10 — 25	4
26 and up	2

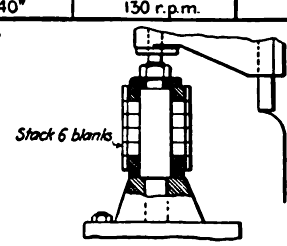
On some machines C has a constant value of 1 for all numbers of teeth. This value will not be used in this article.

Using the notation given above for disk-cutter machines, the basic formula for the computation of output follows:

$$\text{Minutes to cut gears} = \frac{TN}{F} + \frac{TN}{R} + \frac{NC}{r.p.m}$$

DRAWING NUMBER J-590	PART NAME Gear		DATE 10-10-21	NUMBER 2700
NUMBER TEETH 40	PITCH 8 P^D	FACE 1 1/4"	AGENT F. B. Franklin Co.	
STYLE Spur	MATERIAL Steel		CUSTOMER J. P. Brown Mfg. Co.	
FEED 0.040"	SPEED 130 r.p.m.		MACHINE No. 18 H	

FIXTURES



CUTTER				TIME	
DIAM.	HOLE	KEYWAY	WIDTH	CUTTING	SETTING
2 7/8"	1 1/4"	5/16" x 5/32"		65.4 min.	6 min.
Use radial hob				TOTAL	EACH
				71.4 min.	11.9 min.
REMARKS				OUTPUT PER HOUR AT 80 PER CENT EFFICIENCY	OUTPUT PER DAY OF 8 HOURS
Cut 6 gears per setting				4.+ gears	32+ gears
Finish 1 cut				NUMBER MACHINES REQUIRED TO CUT GEARS PER DAY	

FIG. 7. ESTIMATE SHEET FOR GEARS CUT BY HOBBING

The solution of the production problem used in connection with the chart for disk-cutter machines with the slide rule is given below.

(1) Set slide so $6\frac{1}{2}$ in. on feed scale is under $5\frac{3}{4}$ in. on travel scale. Then move runner so hairline coincides with 12 on N scale, and on same hairline read on Min. scale for disk cutter, 10.6 min. cutting time.

(2) Set slide so 160 in. on return scale is under $5\frac{3}{4}$ in. on travel scale. Then move runner so hairline coincides with 12 on N scale, and on same hairline read on Min. scale for disk cutter 0.43 min. returning time.

(3) Set slide so 60 on r.p.m. scale is under constant 4 on travel scale. Then move runner so hairline coincides with 12 on N scale and on same hairline read on Min. scale for disk cutter 0.8 min. indexing time.

(4) Add the three results together and their sum is equal to 11.83 min., total cutting time for three gears.

An Estimate Sheet For Recording Computations

In Fig. 6 is illustrated an estimate sheet upon which production computations are recorded. The particular sheet shown has the result of the example just solved thereon.

Making use of the notations already given for hobbing machines, the fundamental formula for computing the probable output follows:

$$\text{Minutes to cut gears} = \frac{T}{r.p.m.} \times \frac{N}{F}$$

The problem used in connection with the hobbing machine chart will be solved by means of the rule, in the manner given below.

(1) Set slide so 130 on r.p.m. scale is under 8.5 in. on travel scale. Then move runner so hairline coincides with 40 on N scale.

(2) Reset slide so 0.04 on feed scale coincides with hairline on runner and under index on Min. scale for hobbers, read 65.4 minutes. total cutting time for six gears.

In Fig. 7 is shown an estimate sheet similar to that illustrated in Fig. 6 on which the result of the above example has been recorded.

With most gear cutting operations the setting time is largely dependent upon the type of machinery, the size and shape of the blank and the skill of the operator.

The Main Issue

By Entropy

It has often been said, and with much truth, that the principal object of manufacturers is to make money rather than to make any particular product. In the same way it may be said that every department of a manufacturing concern should be so conducted as to make the greatest net profits, always taking into account the permanency of the business and having due regard for the ethics of trade.

Every little while business is subject to fads that for the time obscure the main issue and which produce remarkable showings for certain departments, without always adding to the net profits. We have had attacks of cost systemitis, of planningitis, of Taylorism, and now we appear to be due for an attack of salesitis. Cost systemitis ran its course until it was discovered that it was important to cut down the cost of all parts of the product, and not merely those to which the cost system in vogue at the moment pointed a finger. Planningitis is still in full sway and will run until experience has shown just where it is profitable and where it is not. Taylorism ran until people became weary of hearing the word efficiency, and has since survived under other names and is at present applied in a less wholesale way.

The new thing, salesitis, briefly is a call to cut down cost of sales, ostensibly to enable this country to get its prices for manufactured goods down where they can be bought by those who need them, really to enable this country to pay a higher rate of wages than before the war and thus preserve a purchasing power that will enable us to live on our own market if we do not get the foreign business that we would like.

The Cost of Super-Service

We are told that it costs too much money to sell us things which we need. We reply that we do not want so much persuasion as we are getting, that we would rather buy as we wish than to have things sold to us. The ideal condition would be one where all advertising was educational and salesmen were merely demonstrators called in by the purchaser to confirm the statements made in the advertisement.

Those of us who make up our minds as to what we want and go after it rather than sit back and wait for salesmen to approach us, want to know why we do not get the cash and carry prices that we are becoming used to in the grocery trade. We feel that having a dozen agents spend ten dollars worth of time each and twenty dollars for traveling expenses to come and try to sell us a hundred dollars worth of goods means an expense that is unjustifiable; and we further are very certain that we are called on to pay for this super-service when we do buy, and that we are paying for similar service every time we buy. Yet we see no way to depart from the present custom. If we do go and buy without cost to the seller we get no rebate and hardly any thanks. So very naturally, seeing that we save nothing by doing otherwise we lie back, even though we know just what we are going to buy, and see agent after agent until the right one comes along and thus we experience that luxurious feeling that comes from being waited on. Being waited on is not only luxurious but it is enervating. Kept up long enough it renders us unable to wait on ourselves.

Without any desire to belittle the importance of getting at some plan to reduce all our selling to the self-service or automatic cafeteria plan, there does seem a danger that we may overlook the proper balance of total cost to total income. If we are to engage in any kind of manufacture the first thing to be accomplished is low cost of manufacture; and low cost of manufacture is first of all made possible by so designing the product that it can be made with the minimum of skilled labor, the least overhead charge, and yet fully meet the legitimate needs of the purchaser.

This last, the needs of the buyer, may, however, include much that is not utilitarian—it may include really artistic qualities as well as usefulness—but no matter what it includes, simplicity of manufacture should be kept in mind because it is just there, on the drawing board, that the greatest possible savings in total cost can be made. Let us not forget the main issue: Can we design so that low cost production can be assured and yet produce a useful product that appeals to the practical and so far as is necessary to the aesthetic side of the purchaser?

Properties of Aluminum Alloys

Why These Alloys Make Good Castings—Saving in Cost Shown in Relative Weights—Advantages of Melting Range, Thermal Conductivity, Rigidity and Shrinkage

FROM SALES DEPARTMENT CONDENSED DATA PREPARED BY THE TECHNICAL DEPARTMENT, ALUMINUM COMPANY OF AMERICA

FOR castings of low cost, or intended to meet special conditions, a comparison of physical properties indicates that aluminum alloys are often superior to other metals more commonly used. These alloys possess a decidedly low density, a shrinkage less than those of brass or steel and a thermal conductivity higher than that of iron. To attain the same rigidity as a cast-iron beam, a No. 12 alloy beam must be only half as heavy. Aluminum is therefore the better metal to use where low weight is the important consideration.

WEIGHT AND TENSILE strength of aluminum alloys are less than those of other cast metals.

Their shrinkage is greater than that of iron, but less than brass or steel shrinkage.

In thermal conductivity aluminum is higher than iron.

Its coefficient of expansion is twice that of iron and steel.

Melting range of its alloys provides for adjustment in mold while hardening.

The low density of aluminum is one of the principal reasons for its extensive use. Iron, steel, brass, bronze, copper, zinc, lead, tin and nickel are all heavier metals. With the exception of magnesium, all the common metals used for casting purposes are from two to three times as heavy as No. 12 alloy. To compare the true cost of any of these heavier metals with that of aluminum, the price of the heavier metal should be multiplied by a factor representing the number of times the weight of a certain volume of the heavier metal is heavier than the weight of the same volume of aluminum. For example, if the price of copper is to be compared with the price of No. 12 alloy it must first be multiplied by 3.11, the factor of copper which represents the number of times copper is heavier than No. 12 alloy, as shown in the last column of Table I.

The density of a metal is subject to variation from changes in both composition and structure. For this reason the values which are given in various books are frequently conflicting because the exact composition and structure are not stated. In general an attempt has been made in Table I to select values which are representative for the metals listed. In the case of aluminum and No. 12 alloy the values hold for dense castings. If the castings are somewhat porous they will have correspondingly lower densities, while if the impurities present are greater, the density may be increased somewhat.

TABLE I. DENSITIES OF METALS

(Data for aluminum from Research Bureau, A. C. O. A. Remainder of table compiled from Smithsonian physical tables and other sources. Values for 20 deg. C., 68 deg. F.)

	Grams Per Cubic Centimeter	Pounds Per Cubic Foot	Weights of equal Volumes With No. 12 Alloy = 1
Magnesium	1.75	109	0.612
Aluminum (Al, 99.7)	2.70	169	0.944
Aluminum (Al, 99.0)	2.71	169	.....
Aluminum (Al, 98.0)	2.73	170	.....
No. 12 Alloy (Al + Cu. 7.0 to 8.5)	2.84 to 2.87	177 to 179	1.00
No. 31 Alloy	3.0	187	1.05
Zinc	7.1	443	2.48
Iron, gray cast	7.1	443	2.48
Tin	7.3	456	2.55
Manganese	7.4	462	2.59
Soft Steel	7.8	487	2.73
Brass, cast (Cu 70; Zn 30)	8.4	524	2.94
Bronze, cast (Cu 80; Sn 20)	8.7	543	3.04
Nickel	8.8	549	3.08
Copper	8.9	556	3.11
Lead	11.3	705	3.95

Materials for motor car construction must possess the property of rigidity as well as that of high tensile strength. The rigidity of a metal depends upon its modulus of elasticity. The modulus of elasticity for No. 12 alloy, as shown by Table II, is 10,000,000 lb. per square inch as compared with 12,000,000 to 14,000,000 lb. per square inch for gray cast iron. If, therefore, beams be made of gray cast iron and No. 12 alloy of equal weight with the weight so distributed that the depth of the No. 12 alloy beam is 2½ times as great as that of the iron beam, the deflection of the cast-iron beam will be about seven times that of the aluminum beam under equal loads. The tensile strength of pure aluminum is low but increases when it is alloyed with copper, as shown in Table III. No. 31 alloy has a tensile strength equal to that of cast iron.

The thermal conductivity of aluminum is relatively high and is about 55 per cent of that of copper at 100 deg. C. The thermal conductivity of alumium increases with rise of temperature. This increase is about 10 per cent at 200 deg. C. and 15 per cent at 300 deg. C., while at 600 deg. C. the thermal conductivity is approximately twice as great as at 100 deg. C. According to these data, taken from the Smithsonian Physical Tables, the thermal conductivity of copper decreases with rise of temperature so that at relatively high temperatures aluminum actually has a higher thermal conductivity. Aluminum has a very much higher thermal conductivity than iron and this property makes the use of aluminum advantageous in the construction of motor parts which it is desirable to keep cool. Table IV lists some of the metals in order of their relative thermal conductivity.

TABLE II. MODULI OF ELASTICITY

Metals	Lb. Per Sq.In.
Lead	2,500,000
Aluminum	9,000,000
No. 12 Alloy	10,000,000
Cast Iron (gray)	12,000,000 to 14,000,000
Soft steel	30,000,000

TABLE III. TENSILE STRENGTHS

Metal	Tensile Strength Lb. per Sq.In.
Pure aluminum, cast	12,000 to 14,000
No. 12 Alloy	18,000
No. 31 Alloy	25,000
Cast brass (Cu 70 Zn 30)	40,000
Cast bronze (Cu 80 Sn 20)	32,000
Cast iron (gray)	25,000
Cast steel (soft)	60,000
Cast copper (electrolytic)	25,000
Cast zinc	4,000 to 12,000

It is important to know the thermal expansion of a metal when it is to be used for castings such as automobile pistons, which are subject to considerable variation in temperature. The linear thermal expansivity of aluminum is intermediate between that of zinc and brass

TABLE IV. RELATIVE THERMAL CONDUCTIVITIES AT 100 DEG. C. (212 DEG. F.)
(Compiled from Smithsonian Physical Tables)

Silver	100	Tin	14
Copper	91	Iron, wrought	14
Gold	71	Iron, cast	11
Aluminum	51	Steel, soft	11
No. 12 Alloy	40	Steel, hard	6
Magnesium	38	Lead	8
Zinc	26	Graphite	4

or copper, and about twice that of iron and steel. Table V shows the linear thermal expansivity per degree for unit of length of various metals. The volume expansion coefficient may be taken as three times the linear expansion coefficient.

The shrinkage of a metal is the linear contraction in cooling from the melting point to room temperature and determines the allowance the patternmaker must use in order to obtain a finished casting of the correct size. The shrinkage of aluminum alloys is somewhat greater than that of cast iron but less than that of steel. The decrease in shrinkage as a result of alloying pure aluminum with copper and zinc, is shown in Table VI. The high shrinkage of the pure metal is one factor which makes its use difficult except for simple castings.

The purest aluminum so far obtained melts at a temperature of 658.7 deg. C. or 1217.7 deg. F. as shown in Table VII. The commercial grades of metal melt at somewhat lower temperatures. Aluminum has the relatively high boiling point of about 1,800 deg. C. and is not appreciably volatile under ordinary conditions at temperatures below 1,000 deg. C. It is not good practice, however, in making castings of aluminum to heat the metal much above its melting point or to allow it to remain molten for a great length of time.

TABLE V. LINEAR THERMAL EXPANSIVITIES
Average Expansion Coefficient, 0 to 100 deg. C. (32 to 212 deg. F.)
(Compiled mainly from Smithsonian Physical Tables)

	Per Degree Fahrenheit	Per Degree Centigrade
Zinc	0.000017	0.000030
Lead	0.000016	0.000028
Magnesium	0.000015	0.000027
Aluminum	0.000013	0.000024
No. 12 Alloy	0.000013	0.000023
Tin	0.000013	0.000023
Cast brass (Cu 71; Zn 29)	0.000011	0.000019
Copper	0.0000095	0.000017
Nickel	0.0000078	0.000014
Cast steel	0.0000067	0.000012
Cast iron	0.0000056	0.000010
Invar steel	0.0000006	0.000001

Alloys differ from pure metals in that they do not melt at constant temperature but over a certain temperature interval. Alloys of eutectic composition are an exception to this rule and melt at constant temperature. The eutectic or lowest melting alloy of the copper-aluminum series contains 32 per cent copper and melts at 540 deg. C. (1,004 deg. F.). No. 12 alloy contains 8 per cent copper; it begins to melt at 540 deg. C. and is completely molten at 636 deg. C. (1,177 deg. F.). On cooling, the molten metal begins to solidify at 636 deg. and is completely solid at 540 deg. These facts are of great practical importance in the case of this alloy because the metal is more or less plastic over a considerable range of temperatures during the freezing process, and as a result, the metal is able to adjust its form to that of the mold without damage to the resulting casting.

The specific heat of aluminum is 0.21 at room temperature. This means that the quantity of heat that would raise the temperature of a given weight of aluminum through one degree, would raise the temperature of the same weight of water through 0.21 of one degree. The specific heat of aluminum increases with rise of temperature and is about 15 per cent greater at 500 deg. C. The mean specific heat in the temperature interval, 20 to 100 deg. C., for a number of metals, is given in Table VIII.

The electrical conductivity of pure aluminum is 61 per cent of that of copper. No. 12 alloy has an electrical conductivity only about 32 per cent of the conductivity of copper. Alloys have been developed which have conductivities less than 20 per cent of that of copper and which have temperature coefficients of resistivity less than half that of pure aluminum.

TABLE VI. SHRINKAGES OF METALS
(Inches per foot)

Pure aluminum	0.21	Brass	0.19
No. 12 Alloy	0.18	Gray iron	0.12
No. 31 Alloy	0.18	Steel	0.25

TABLE VII. MELTING POINTS
(These are the values accepted by the Bureau of Standards and given in their Circular No. 35. They hold for samples of the highest obtainable purity; less pure samples will in general have a lower melting point.)

Metal	Degrees Centigrade	Degrees Fahrenheit
Aluminum	658.7	1,217.7
Magnesium	651	1,204
Copper	1,083.0	1,981.4
Manganese	1,230	2,246
Nickel	1,452	2,646
Silicon	1,420	2,588
Iron	1,530	2,786
Zinc	419.4	786.9
Lead	327.4	621.3
Tin	231.9	449.4

TABLE VIII. SPECIFIC HEAT
Mean Specific Heat, 20 to 100 deg. C. (68 to 212 deg. F.)
(Compiled mainly from Smithsonian Physical Tables)

Water	1.000	Zinc	0.093
Magnesium	0.248	Copper	0.093
Aluminum	0.216	Brass	0.09
Cast iron	0.12	Tin	0.055
Manganese	0.121	Lead	0.031
Nickel	0.109		

Knowing the Other Fellow

By Robert Grimshaw

The careful driver who knows his horses will be able to control them under adverse circumstances better than if he does not know their temperaments and capabilities. If this is true of the relations between the driver and his horses, how much more is it true of the leader and his human team, that have more species of temperament and more kinds of education, and can express their preference "without let or hindrance?"

Some men are amenable to reason; others "are open to conviction, but would like to see the man who could convince them." Some can be influenced only by "a soft word fitly spoken"; others again call for firmness, backed with authority. Some, indeed—fortunately few—must be handled like the children of the negro washerwoman, who on being complimented on their good behavior, and asked what method she employed to raise them, replied, "Ah raise 'em wid a bar'l stave, an' Ah raise 'em frequent!"

Some horses have been rendered balky by incompetent drivers, and once they have been so ruined, they must be handled skilfully until properly broken. So it is with men; if they have been oppressed and abused, it may take a period of firmness before they can be convinced that they will be handled gently if only they will respond.

Methods of Machine Tool Design

Conclusion of Third Article—Various Types of Machine Tool Gear Drives—A Number of Rules Applicable to Machine Tool Drives

By A. L. DeLEEUW

THE arrangements in use for obtaining variable speeds by means of gear shifts count up into the hundreds, and possibly thousands. It would be impossible to give rules or instructions as to which arrangement should be used unless all conditions were known. There are probably several thousand patents in existence dealing with various gear arrangements for variable speeds or feeds. The general tendency has been to make these arrangements more and more simple to operate, and to build them into a smaller and smaller amount of space. And the means to accomplish these aims have been the alloy steels, which permitted small gears to carry heavy loads; ball bearings, which did away to a large extent with friction; lubricating devices, which again reduced the friction on the shafts and made gears run more noiselessly, thus permitting higher speeds; and the automobile gear shift.

It used to be customary to make a change of speeds by removing a pair of change gears and putting on another pair, and this system is still in use for such machinery where shifts in speed are infrequent. It is not of much importance that a couple of minutes will have to be spent on a change of speed if the new speed is going to be used for days, or possibly weeks, at a time. Where frequent shifts have to be made, change gears are no longer used to any extent. When using change gears it is important to have them all with the same bore so that they can be used interchangeably. It is further important to avoid segments or any frail or

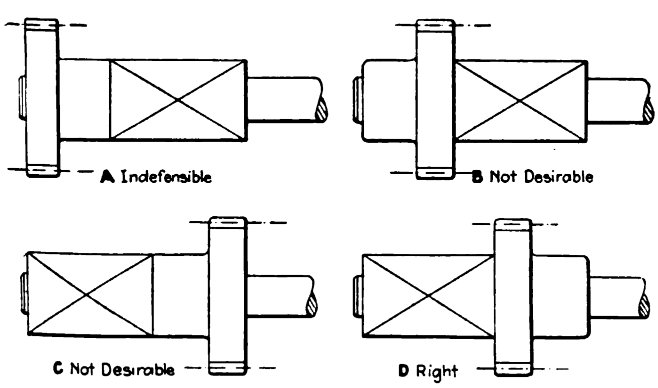


FIG. 22. METHODS OF MOUNTING HUB GEAR

loosely hitched up machine member, unless the amount of power to be transmitted is very small indeed. Where a large amount of power must be transmitted some provision should be made to support the outer end of the shaft. Where the change gears are confined in a box-like casting it should be possible to provide this casting with a lid or door containing the outward bearings for the change gear shafts.

There are two principal ways in which change gears are applied, namely, with or without the help of a movable quadrant or similar device. If they are applied without such a device, the sum of the numbers of teeth of two meshing change gears must be constant. In Fig. 23 *A* and *B* are the two change gear shafts, and *P* and *Q* are the change gears. It is possible to put a new gear on *A* with one tooth less, in which case *B* must receive a gear with one tooth more. We may continue this until we have gear *Q* on *A* and gear *P* on *B*. If the smallest gear on *B* should have *M* teeth and the

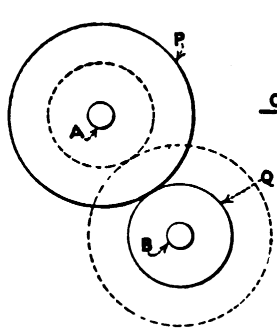


FIG. 23

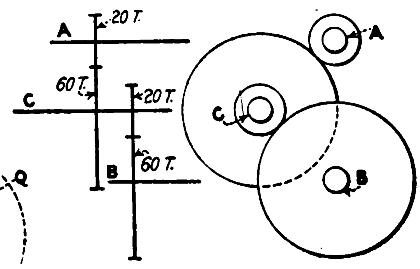


FIG. 24

FIG. 23. CHANGE GEARS ON FIXED SHAFTS. FIG. 24. COMBINED SHIFT AND REDUCTION

largest gear on *A* should have *N*, then the sum of the number of teeth, *N* plus *M*, will be constant for any combination of gears we may put on the shaft; and the number of speeds we can obtain in this manner will be $N - M + 1$. However, if we should use all of these speeds we would sometimes slow down from *A* to *B*, and sometimes speed up; and, as particularly for heavy work, speeding up is not desirable, we will have to stop changing gears when both are of approximately even size. So, as a rule, only $\frac{N - M}{2} + 1$ change can be obtained.

Sometimes a gear *reduction* is combined with the gear *shift*. Such a device is shown in Fig. 24, where *A* and *B* are again the two shafts. A stud *C* carrying a compound gear is placed somewhere between *A* and *B*, though not necessarily in a straight line. It is not possible to say before hand how many speeds are obtainable in this manner, because there will be a time when one of the gears interferes with one of the shafts or bearings and when that time will be depends largely on the position of stud *C* in relation to shafts *A* and *B*. However, it will readily be seen that there are many more possibilities than before.

If, for instance, the pinion on shaft *A* cannot have less than 20 teeth, the gear on shaft *C* not more than 60 teeth, the pinion on stud *C* not less than 20 teeth and the gear on shaft *B* not more than 60; and if, again, we should not want to speed up—in other words, if we never wish to have a gear on shaft *A* larger than the meshing gear on stud *C*—it would be possible to have 21 speeds by merely changing these two gears. We would also get 21 speeds by changing pinion on stud *C* and gear on shaft *B*; but this does not mean that the total number of speeds obtainable will be $21 \times 21 = 441$, because if we have the combination 20-60—21-59 we will get the same speed as if we had 21-59—20-60; and furthermore, many of the speeds will be so very close together that they are of no practical value. However,

an arrangement, as the one shown here, is of great value when we want to obtain the following:

To get a variety of speeds over a wide range and so selected that we obtain as nearly as possible the proper speed for a few operations which we wish to carry out on a given machine.

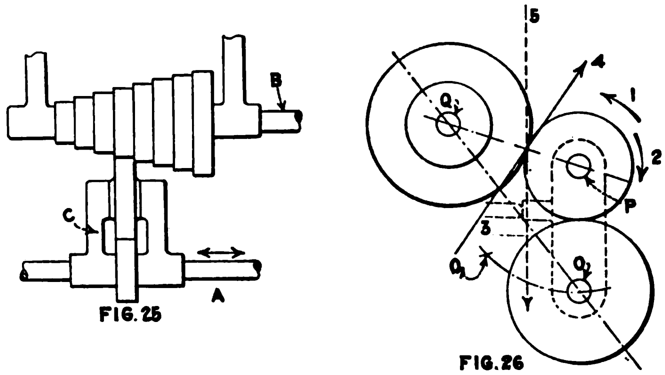


FIG. 25. OLD-FASHIONED CONE, PINION AND IDLER.
FIG. 26. DIAGRAM TO SHOW ACTION OF IDLER

The other arrangement of change gears is the well-known system in which a segment and idler are used, such as the change gear devices on the older style lathe, on the dividing head driving attachment on milling machines, and on various other machines such as the Brown and Sharpe screw machine. As a rule, the amount of power to be transmitted by such a device is so small that it is permissible to do some speeding up. However, it should not be forgotten that this speeding up will lead to a marked irregularity in the movement of the driven shaft, something which is quite noticeable when we attempt to mill a short lead spiral.

One of the favorite devices for obtaining the number of speeds by means of gears was the cone of gears with tumbler. Originally intended for a lathe feed it was gradually applied to drives transmitting considerable power and was found to lead to serious difficulties. Fig. 25 shows a cone of gears with pinion and idler in its most primitive form. In this form the device is only adapted to light feeds. *A* is the driving and *B* the driven shaft. The driving pinion is made to slide along the shaft by means of bracket *C* which also contains the stud or shaft for the idler. A lever attached to bracket *C* and not shown in the illustration serves to move this bracket endwise and also to turn it through the necessary angle to mesh the idler with one of the gears of the cone. All the tooth pressure is against the shaft which must necessarily have considerable length between the bearings, so that all the pressure between the gears of the cone and the idler causes the shaft to bend. Many variations of this construction have been made and there are many patents in existence dealing primarily with the means for engaging the idler with the selected gear of the cone. In many of these constructions the mechanism for the handling of bracket *C* is divided in two parts—one for the axial and one for the turning motion of the bracket. With these constructions two separate movements are required on the part of the operator for engaging the gears.

In Fig. 26 is shown a couple of gears of the cone, the idler and the driving pinion in diagrammatic form. Supposing the pinion to do the driving (which is not always the case as in some arrangements the cone is the driving member) we will notice that at the moment of engagement the idler may either pull itself in or may try to push itself away, depending on the direction of rotation. In the illustration with the center of the driving shaft located at *O* and the idler running in the direction of arrow No. 1, there will be a tendency to push the idler away at the moment of engagement, which will make the manipulation difficult and, in case of the transmission of considerable power, entirely impossible. Furthermore, the idler coming into engagement in the general direction of arrow No. 1, there is no possibility of placing a stop behind the bracket unless this is done by means of a third movement on the part of the operator, after the gears are in mesh; so that in a practical arrangement of this kind there would be a constant tendency to push the gears out of mesh. Any variation in load would cause the idler to move either further out of mesh or back again to its original position.

If the idler rotates in the direction of arrow No. 2, then it will have a tendency to pull itself in, but this tendency can be overcome by placing a stop 3, against which the bracket can bear when the gears are fully in mesh. We see, then, that it is important to select the proper direction of rotation for the driving gear.

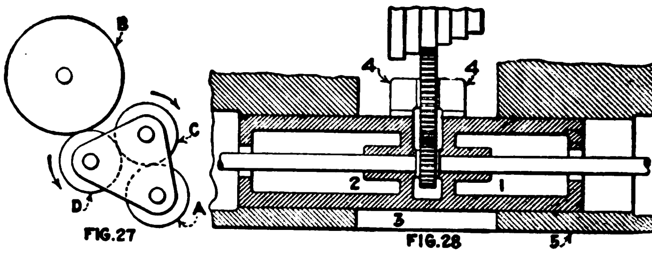


FIG. 27. TUMBLER GEAR WITH TWO IDLERS. FIG. 28. SUCCESSFUL ARRANGEMENT FOR LIGHTER DRIVES

We are absolutely sure that if the idler runs in the direction of arrow No. 1 there will be a tendency to push it out of mesh, but we are not exactly sure that it will be pulled into mesh when it runs in the direction of arrow No. 2 because this depends not only on the direction of rotation but also on the relative location of the centers *O*, *P* and *Q*, and on the angle of action of the gear teeth. The solid line 4 indicates the direction of the line of action when rotating in direction of arrow No. 1; the dotted line 5 indicates the same for the opposite direction of rotation; and as long as this line falls between the centers *O* and *Q*, there will be a tendency to pull the idler into mesh, but if the center *O* were displaced and brought into a new location O_1 there would still be a tendency to push the idler out of mesh, notwithstanding that it has the proper direction of rotation. A careful investigation is therefore necessary as to the relation between the centers and the line of action. Tumbler gears have been used long before the cone of gears was applied to machine tools. Tumbler gear arrangements were found in the elevating mechanism for radial drills and in the reverse mechanism for the feeds on a lathe, and considerable trouble was experienced with such arrangements because the idler was necessarily running in the wrong direction part of the time.

In Fig. 27 is shown such an arrangement. *A* is the driving gear, *B* is the driven gear, and *C* and *D* are two idlers, each of which can be brought into mesh with *B*. These two idlers run in opposite directions and only one can have the proper direction.

Coming back to Fig. 26, it would seem at a first glance that it would be always easy to give the idler the proper

direction and this would be the case if there were only one gear in the cone with which the idler must mesh. However, there are several gears in the cone, and the diameters of these gears may vary so much that in some cases the line of action falls between the centers and in another case outside of the centers. If, for instance, in Fig. 26 the center *O* were near, but still to the right of line 5, and if at the same time the gear on center *Q* were made much larger, the line of action would fall outside the line *OQ*.

A construction is shown in Fig. 28, by which the driving shaft is entirely relieved of the pressure on the gears and which, at the same time, has the advantage of making a dust-free arrangement. The driving shaft finds its bearings 1 and 2 in a sleeve or cylinder 3. Pinion and idler mesh in a gap of the sleeve, the idler being held in a bracket 4, which is bolted to the sleeve. The handle for operating the sleeve is attached on the outside and is not shown in the illustration. The sleeve can slide and rotate in the bore of the frame 5. The pressure between the gears is therefore taken up on the sleeve. This arrangement has proved to be very successful and is quite well adapted to the lighter drives and to feeds. Where heavy drives must be taken care of it is advisable to use some other arrangements on

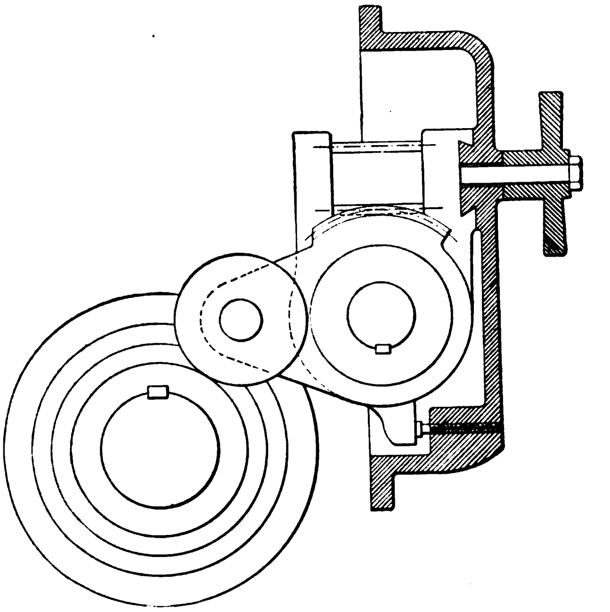


FIG. 29. HEAVY-DUTY TUMBLER GEAR ARRANGEMENT

account of the excessive size of the sleeve when the driving pinion becomes large.

In Fig. 29 is shown an arrangement used by the writer in the construction of the high-power Cincinnati milling machine, and which was called upon to transmit as much as 35 hp. In this construction a single member served to move the pinion and idler endwise as well as angularly. The endwise movement was obtained by moving a pilot wheel attached to the bracket containing pinion, idler and some other parts. When in the proper endwise position the pilot wheel was turned. This turning motion was transmitted to the bracket holding the idler by means of a worm and worm wheel, or rather a pair of spiral gears, the teeth of which had such an angle as to be self-locking. When the gears were in mesh, the turning movement of the pilot wheel was continued and this extra movement brought a hardened stop in the bracket up against a hardened pin in the frame of the machine, thus clamping the bracket in position. Here, also, the bracket supported the driving shaft instead of the driving shaft supporting the bracket, as was the case in the earlier constructions.

In order to function properly the arrangement should always run in the same direction, and this is particularly important with heavy drives. If there must be a reverse in the system, the reverse mechanism must be applied *after* the cone and tumbler and not between the first driving member and the tumbler arrangement. As there is necessarily some reduction in the tumbler arrangement the torque on the reversing mechanism will be greater after the cone of gears than before.

At one time arrangements such as shown in Fig. 30 were commonly used for changing feeds, and even in some cases for changing speeds of a machine tool. Such an arrangement is known as a pull-pin arrangement. It consists, generally speaking, of two cones of gears meshing with each other. One of the cones is keyed to its shaft, the other one runs loose on the shaft, and each one of the gears of this cone can be keyed to the shaft by means of a sliding key, operated by means of a rod going through the center of the shaft. There are many objections to this construction and it has gradually lost favor and is very seldom, if ever, used in modern construction.

In Fig. 30 *A* and *B* are the two shafts connected by the two cones of gears. Gears 1, 2 and 3 are keyed to shaft *A*, and gears 4, 5 and 6 are running loose on shaft *B*. The crosskey 7, connected to the pull-rod 8, moves in a slot of shaft *B* and can engage any one of the three gears 4, 5 or 6. In order to allow crosskey 7 to slide from one gear to the other, counterbores are provided in these gears and located so that when the crosskey is in the counterbore the gear is free to revolve. One of the counterbores is shown at 9, and the keyseated portion of the gear at 10. It is very obvious that this arrangement makes a weak construction of shaft and key and allows but little bearing of the three gears on the shaft unless the gear hubs are made excessively long, which would probably take up valuable space in the mechanism.

The question of lubrication, also, becomes a difficult one. It is not well possible to bush the gears, and it is very difficult to bring oil between the gears and shaft *B*. Undesirable as this arrangement is, it can be made worse by making *B* the driving shaft instead of the driven one. To make this clearer, we will assume certain figures for the number of teeth of the gears and speed of the driving shaft. Assuming *B* to run 300

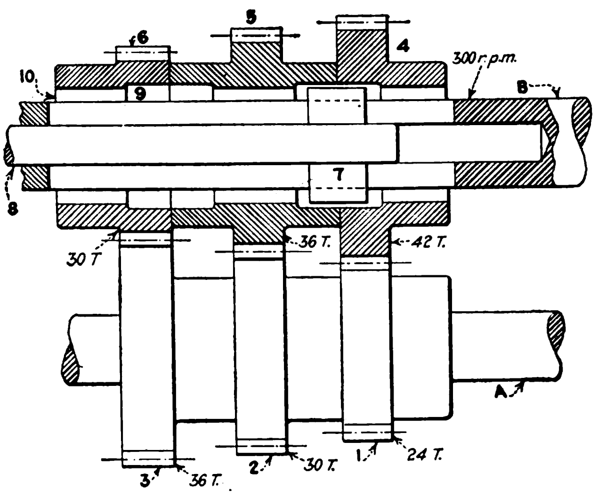


FIG. 30. PULL-IN CHANGE SPEED DEVICE

revolutions, and assuming the number of teeth to be as shown in the sketch, and further assuming that the key is engaging gear 4, shaft A must run 525 r.p.m.; and as gear 3 meshes with gear 6, this latter must run 630 r.p.m., which causes a relatively high speed between gear 6 and the shaft on which it runs. This condition will become still worse if there is a considerable slowing down between B and A. For this reason, if this kind of arrangement is used at all, shaft A should be the driving shaft.

Many variations have been made on this construction, but as none of them are desirable we will not go further into this matter.

The gear arrangement which is most commonly used at the present time and which has less objectionable features than any discussed heretofore is the so-called selective sliding gear. As an example of the application of such gearing will be given in a later chapter we will not discuss it here. We wish to point out, however, that the following rule may be put down as of quite general applicability:

For standard machinery, in which speeds or feeds must be arranged in geometrical progression, selective sliding gear arrangements are to be preferred; while for special machinery, in which certain definite speeds must be obtained, the change gear system is usually the simplest and best.

There are some other gear arrangements in existence which have their special applications and which will be taken up later on.

Try to obtain the desired amount of power by belt *speed* rather than by belt *width*. Belt speeds up to 3,500 ft. per minute are permissible in machine tools, but cannot always be obtained.

Try to obtain belt speed by a high number of revolutions of pulley rather than by a large diameter.

NOTE: The highest practical number of revolutions for a pulley depends on the nature of the lubricating system and other items. In any case, however, the shaft speed should be kept as high as conditions will permit.

Belts wider than 8 in. should never be used with cone pulleys. A 6-in. belt is difficult to shift. An 8-in. belt can still be shifted, but would not be practical if such a shift were of frequent occurrence. Belts wider than 8 in. cannot be shifted, except where some special device is used for the purpose.

The ratio between largest and smallest cone pulley steps should be kept as low as possible, so as to avoid too great a difference in the amount of power obtainable.

Where more than one countershaft speed is used the ratio between these speeds should be kept as low as possible so as not to get too great a variation in power.

As with other pulleys, cone pulley steps should be as large in diameter and of as small a face as practical.

Not less than ¼ in., and preferably ½ in., should be allowed for the width of the cone pulley in addition to the width of belt. Where the belt runs between a larger step and a flange, ½ in. is the minimum allowance.

Cones in the countershaft for the purpose of obtaining various countershaft speeds should be avoided as much as possible, and should never be used where speeds have to be changed frequently.

Belts which must be frequently shifted on cone pulleys should preferably not run faster than 2,000 ft. per minute.

Countershafts suspended from the ceiling on ordinary hangers should not run more than 400 r.p.m. If higher speeds are necessary the countershaft construction should be self-contained in a single casting which can be bolted to the ceiling.

Gears made by the ordinary processes, that is, without extreme care, should have speeds not exceeding 700 ft. for cast iron; 700 ft. for mild steel; 600 ft. for hardened gears; 900 ft. for bronze and steel; 2,500 ft. for rawhide, micarta or fibroid.

The gears alluded to are supposed to have been cut with a standard rotary cutter and they are supposed to run dry. Where special rotary cutters are used, or where the gears have been made by the Fellows or hobbing process, higher speeds can be used, provided that the gears are not hardened. Higher speeds can also be used when the gears run in oil or grease.

A gear which is keyed to the shaft or which runs on a shaft being bushed for that purpose, should have a sufficient number of teeth to allow for the proper thickness of metal between the root of the tooth and the top of the key or the outside diameter of the bushing. If the diameter of the shaft is considered as the pitch diameter of some imaginary gear, then the gear we design should have at least eight teeth more than this imaginary gear. Denoting the diameter of the shaft by D, and the pitch of the gear by P, we should make the gear with not less than $DP + 8$ teeth, though for light work we may occasionally use $DP + 7$.

Wherever possible, overhanging gears should be avoided.

A gear with a hub should have this hub turned away from the bearing wherever possible. A construction such as shown in Fig. 22-A is indefensible. Constructions such as shown in B or C cannot always be avoided, but are not desirable. The construction shown in D is proper.

Hunting cogs are of no importance for cut gears. They are, however, of some importance if the gear is hobbed with a multiple thread hob. In that case, however, the hunting cog does not refer to the two meshing gears, but to the gear in its relation to the hob. If, for instance, a gear is cut with a triple thread hob, its number of teeth should not be a multiple of three. The idea that gears with hunting cogs will gradually improve each other as to shape of tooth is a fallacy. If there is a defective tooth in one of the gears there will be a tendency to spoil all the teeth of the mating gear, rather than a tendency of the mating gear to improve the defective tooth.

Start a geared arrangement with the highest practical shaft speed in order to keep dimensions to a minimum. This is advantageous in regard to bulk and cost.

Make no unnecessary reduction, but keep shaft speeds as high as possible up to the last moment.

In making gear shift arrangements avoid as much as possible all speeding up.

Use as few groups or shifts as possible.

Make the shift by the simplest possible means, so as to avoid possible confusion on the part of the operator.

Avoid duplicating or overlapping of speeds.

NOTE: This rule should be applied with caution. There are cases, particularly in special machines, where the overlapping of speeds may be beneficial; for instance, where we have two ranges of speeds, one for roughing and one for finishing; so that a single shift will always produce the corresponding finishing and roughing speeds. In such a case it may well be that the highest roughing speed is higher than the lowest finishing speed.

And finally, the most important rule of all: None of the above rules should be applied without carefully going into the merits of the case.

Recommended Practice in Carburizing

Suggestions for the Selection of Carburizing Material—Methods of Testing It—The Best Materials for Different Kinds of Work—Design and Use of Carburizing Pots

BY S. P. ROCKWELL
Metallurgical Engineer, Whitney Mfg. Co.

IT IS to be regretted that the average purveyor of carburizing materials argues fast penetration. Furthermore, many consumers consider fast penetration as a mark of merit. Eighty to ninety per cent of the practical men who handle carburized work consider only the depth of penetration and base their judgment on this alone. They overlook what is more important—the percentage of carbon in the case and the rate at which the carbon decreases toward the core. These last conditions are excusable as few plants are equipped with means for their determination. Often the examination of a carburized product will show carbon as high as 1.60 per cent for an appreciable amount of surface depth. This will rarely interest them, but these same people would never think of using carbon steel with any such amount of carbon.

Fast penetration is, of course, a desirable feature from a cost standpoint, but it is, almost without exception, accompanied by excessive high carbon surface and its product, free cementite. In order to put the free cementite into solution, the saving made in the time of the carburizing operation is usually lost by the first or high heat of double heat-treatment.

The fact does not appear in any publication that a steel of a specific analysis has a certain rate for a certain intensity of carbon absorption. The writer, however, from many observations, believes that this condition exists. In other words, a 1020 steel will absorb an eutectic case of a certain depth in a certain length of time, and nothing will increase this time, without causing the case to become hypereutectic.

It is rather difficult to say with any degree of surety what the correct amount of surface carbon should be in a casehardened gear. For ball bearing work a eutectic case (0.86 per cent carbon) is desired. The bearing after carburizing is considered to have 1.10 per cent carbon in the outer case. The grinding, however, is calculated to remove this. Due to warpage and the resulting uneven grinding it is a question whether the results desired are always attained.

For camshaft work considerable high carbon is permissible, providing the resulting cementite is in solution and not in the free state. When properly heat-treated a mosaic surface effect is produced. Finely divided particles of extremely hard cementite are imbedded in a softer matrix of eutectic steel. This condition is excellent for retaining the film of lubrication.

The gear, in a way, is subjected to both the requirements of the bell bearing and the camshaft. The pressure per unit of contact is less than the bearing and more than the camshaft. Furthermore, the gear must resist sliding and rolling contact. It is surmised that the surface carbon should be between 1.00 and 1.10 per cent. The inspection of work to enable one to hold to these conditions is a difficult procedure, unless a standardization of the carburizing material employed is made by the user for his own particular requirements.

The question of standardization of the materials and the specifications of the same are two different things. It is probable that if more users of carburizing materials would test them out for results the makers would be forced to supply according to specifications.

One concern buying carburizing material selects at random one bag from ten, and carburizes a 1-in. bar, 6 in. long, in a 5 x 10-in. pot at 1,650 deg. F. for 24 hours and pot cools. The bar is 1020 steel and all elements are within the specification range. The bar is centered and the surface removed before the carburizing operation. After carburizing and polishing with emery to remove adhering carburizer, 0.010 in. of the surface is removed in the lathe and a carbon combustion is run on the chips. The result, together with a micro-examination of the case, decides the question of rejection or acceptance of the shipment. In the operation of such a method of standardization, conditions should permit of exact duplication. In this respect uniformity of furnaces and calibration of pyrometers are of great importance.

Summarizing a comparison between types of carburizers to compare costs, case depth, surface case, toughness and hardness we have:

		Rating
(1)	Material with the greatest zone of eutectic	25
(2)	Material showing best joining of the different carbon zones	25
(3)	Material least destroying the core strength	15
(4)	Material giving greatest hardness with freedom from soft spots on single quench	15
(5)	Material giving the greatest case depth	10
(6)	Material giving the best surface	5
(7)	Material giving the greatest economy	5
	Total	100

There are, strictly speaking, but four different types of carburizers; they are classed by their physical form as follows: (1) Powder materials, in which the generator and the energizer are in a powder form, and are thus mixed together to form a mechanical mixture. Such materials are "hydro-carbonated bone black" No. 9 "Ajax," etc.; (2) pill materials, in which the generator and the energizer are in powder form, but are held together by a binder, which in itself may be a generator or an energizer. Such a material is "carbo;" (3) pellet materials, in which the generator is a granule of solid carbonaceous material coated with an energizer by the help of a binder. Such a mateiral is "Quick Light-A;" (4) pellet and powder materials, in which the generator is a granule of solid carbonaceous materials and the energizer is in the form of a powder. A certain per cent of the powder may also be a generator. Such materials in most common use are "Bohnite," "Carbonite," "Pearlite," etc.

Three other mediums are in use for carburizing, namely, bone, leather and gas. Bone is classed as a

Paper presented before Buffalo meeting of the American Gear Manufacturers' Association.

pellet material with this exception, that the energizer is contained within the bone. Leather is classed as a powder material; its energizer is a nitrogenous compound. Gas differs from the rest in that it is the result of the carburizing property of all carburizers. Charcoal, coal and coke cannot be classed as carburizers, due to their difficulty of control. Strictly speaking, they are generators, and are sometimes used as filters.

Choosing A Carburizer

To decide on any type of carburizer, one must first know the conditions of carburizing, and the results desired.

The writer offers the following as a guide for selection:

1. For low cost, and to secure uniform case with 0.10 to 0.20 less carbon in the case than is usually secured under pot packed condition; use tumbling barrel method developed by American Gas Furnace Co. with gas or with solid carburizer. With this system heavy work will be marred, and the method is not recommended for threaded work. With solid carburizer 3 lb of material will carburize 50 lb. of work to 0.045 in. depth at 1,650 deg. F. Use any type of carburizer.
2. For fast heating use coarse mesh carburizer such as types 2 and 3. The air spaces allow room for the heat-generated gases to thermo syphon and offer unrestricted passage for heat-transference to center of pot.
3. For non-shrinkage, use fine mesh carburizers, preferably a coke type generator or a carburizer with a lot of inert filler. These latter usually contain 40 to 60 per cent of petroleum coke.
4. For low carbon case, use charcoal generator with oil hydro-carbon energizers. Such materials are "hydro-carbonated bone black," bone and charcoal.
5. For high carbon case, use chemically energized materials. Such energizers contain cyanides, barium, ammonium, salts and carbonates. Carburizers containing forms of leather are also used.
6. For deep depths, use coke and charcoal generators with oil hydro-carbon energizers combined with fine mesh and considerable inert material.
7. For very clean surface work, use charcoal and bone carburizers where the energizer is naturally contained in the bone.
8. For work which must be carburized at low heats, use raw bone or carburizers containing a large percentage of raw bone.
9. For work which must be carburized at low heats to secure mottled effects, and clean surfaces, use charcoal, charred bone, charred leather or combinations of these. Avoid chemicals.
10. For copper-plated work, use charred bone, charcoal and oil hydro-carbon energized materials, together or alone. Avoid chemicals.
11. For extreme hardness of case use nitrogen carrying compounds, which would be cyanogen energized compounds, and leather mixtures.
12. For local carburizing where compound is forced by pressure and caked about zone desired to receive an increase of carbon, use fine mesh materials combined with a semi-liquid binder, such as molasses, tar and resin.

After a decision has been made on the type of carburizer for the particular class of work it is to be used with, the user will find that he is in no way restricted as to the dealers from whom he may purchase. Nearly all the standard carburizing materials dealers make all types, but they are apt to confine their advertisements to one or two more popular types. It will further be found that each type can be purchased in different variations of mesh and grain size.

How to Buy

Buy from a responsible house.

Study what type, mesh, generator and energizer is best fitted for your work.

Consider as first cost, the cost per cubic foot rather than the cost per pound.

Test the material under conditions as nearly like regular practice as possible. This means depth, representative work shape, temperature, and pot size.

Examine the pot-cooled sample for case structure by the microscope, and by carbon combustion. The microscope will be found invaluable for this purpose. Once one becomes familiar with estimating the carbon by the microscope, the combustion method can be dispensed with except as a means of check.

Maintain your standard for future shipment of material.

If soft spots develop on the hardened work do not blame the carburizer. Soft spots are due to rust on work prior to carburizing, phosphorous banding, delayed quenching, copper or sulphate spots, slag, faulty grinding, cold-rolled or planished surfaces, scale formation, excessive oxygen in hardening fires, faulty quenching medium, too low hardening heats. These faults cannot be laid to the carburizer. The carburizer rarely makes soft spots if it contains no excessive amounts of inert filler, or burned out material such as ash dust. These conditions should be guarded against. If hardened work has soft spots, and these areas are carefully marked and the piece carefully rehardened two results can be obtained:

(1) Original soft areas become hard. In this case trouble is not due to carburizing.

(2) Original soft areas stay soft. In this case the trouble may be due to rust, copper, decarburized in hardening, or to defective carburizer.

With the aid of the microscope, polishing wheels and cloth, and dilute nitric acid, any of these conditions may be accurately discovered.

Special alloy heat-resisting pots, are by far the best investment when compared to cast iron, malleable iron and cast steel. The round pot will be found to give a greater life than the square pot, due to the equalization of expansion and contraction stresses. The cored or chimney pot is only efficient, considering its added cost, where the chimney is 5 in. in diameter or over. Too large pots should be avoided for small work. The round pot will be found most satisfactory for pinion and ring gear work. It offers the advantage of even heating, and prevents the tendency to overcrowd the furnace hearth space.

Square or rectanglar pots are best for splined shafts, but the work must be packed with due regard to the transference of heat. The size of the pot should not be greater than the work demands. This is imperative from the standpoint of handling, slowness of heating and the subsequent unevenness of carbon penetration from center of pot to outside. It is also imperative that the pot should not be greater than is required by the work on account of the slowness of cooling where work is pot cooled with the subsequent separation of the carbon zones.

The best dimensions of the pot depend largely on the furnace. Too high pots are as bad as those too large in diameter. The average furnace varies greatly in temperature from top to bottom, and this variation increases with the arch height. A well proportioned pot never exceeds in height the greatest width or the diameter. The height is best made between $\frac{5}{8}$ and $\frac{7}{8}$ of the greatest width or diameter. All pots should be cast with legs to allow circulation of heating gases. For this same reason the floor of the furnace should be scraped clean after each heat. Great care should be used in sealing of the pots. The tighter the seal the more uniform the results. No pot should be used that is cracked, as this is the cause of blistered work. The pot becomes a veritable blast furnace, containing its own fuel.

Factory Storekeeping and Material Control

The Third Article—Balance Sheets as the Material Control Center—Four Types of Sheets—When and How To Use Them

BY HENRY H. FARQUHAR

THE balance records, as has been indicated, should form the heart of the supply service of the factory, through which material control is secured. But they should do more than this. They should serve both production and accounting, if properly set up and regulated, in furnishing quick and accurate information as to the material status at any time—information of increasing value and reference as the business expands. In order that production may be adequately served, it follows that the balance sheets must be designed according to the need of that particular type of production.

Three general types of balance sheets are necessary to meet the three types of production calling for a control of replenishment under one of the plans *A*, *B*, or *C*. Each of these three general types are found in various forms, embodying different arrangements of columns designed to provide various sorts of information. No attempt will be made to present or discuss all of the possible or existing arrangements since the variety is infinite and the particular typography is a matter largely of choice and of comparatively little moment. Only the considerations necessary to the effective use of each will be taken up, illustrated by one example of each type of sheet.

Plan A. Here replenishment is governed by the amount on hand in the storeroom. This requires the simplest form of balance sheet in set-up and in operation. It needs only two main columns, one column for data relating to the material on order, providing subcolumns for the date and number of the requisition, the number of the purchase order, the amount received and the amount outstanding; and one column for the amount on hand in the storeroom, with subcolumns showing the amounts issued on what date and to what order, the total value and the value per unit. If the operation of the balance sheet presented under plan *B* is thoroughly understood, the operation of this simpler sheet illustrated by Fig. 2 will need no explanation, and no further description will therefore be given.

For the author's forthcoming book.

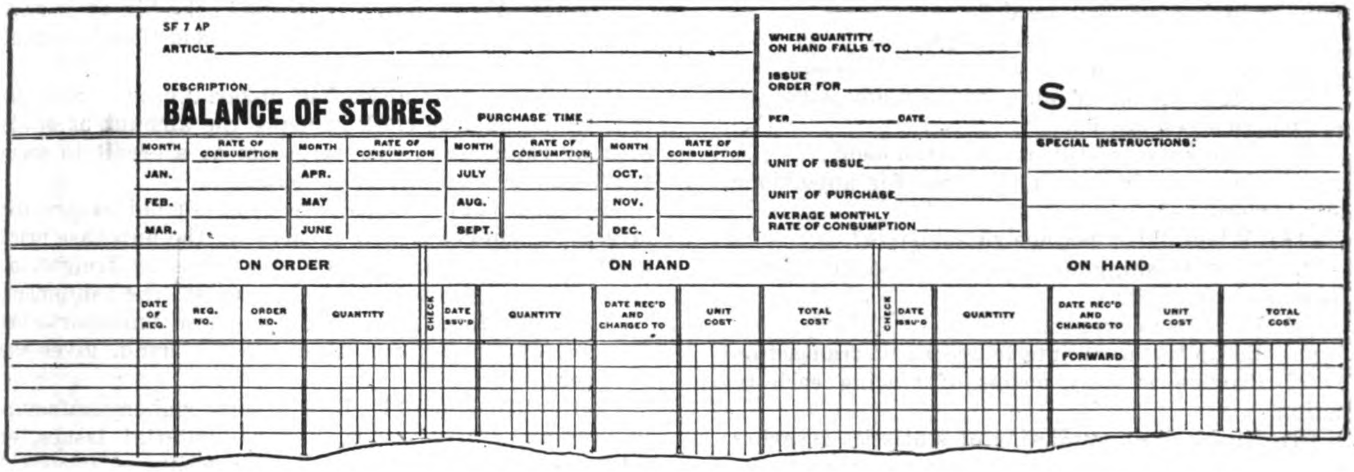

SF 7 AP
ARTICLE
DESCRIPTION
BALANCE OF STORES
PURCHASE TIME
WHEN QUANTITY ON HAND FALLS TO
ISSUE ORDER FOR
PER DATE
S
MONTH | RATE OF CONSUMPTION | MONTH | RATE OF CONSUMPTION | MONTH | RATE OF CONSUMPTION | MONTH | RATE OF CONSUMPTION
JAN. | APR. | JULY | OCT.
FEB. | MAY | AUG. | NOV.
MAR. | JUNE | SEPT. | DEC.
UNIT OF ISSUE
UNIT OF PURCHASE
AVERAGE MONTHLY RATE OF CONSUMPTION
SPECIAL INSTRUCTIONS:
ON ORDER
DATE OF REQ. | REQ. NO. | ORDER NO. | QUANTITY
ON HAND
CHECK | DATE ISSU'D | QUANTITY | DATE REC'D AND CHARGED TO | UNIT COST | TOTAL COST
ON HAND
CHECK | DATE ISSU'D | QUANTITY | DATE REC'D AND CHARGED TO | UNIT COST | TOTAL COST
FORWARD

FIG. 2. PLAN *A*, BALANCE SHEET FOR REPLENISHMENT BY AMOUNT ON HAND

It must be emphasized again that such a method of regulating material has very limited applicability. It is entirely safe only when the average rate of use employed in ascertaining the minimum stock to be kept on hand is the actual rate of use throughout the year; in other words, where there is an entirely uniform rate or flow of materials. Such a balance sheet must not be expected to prove satisfactory under conditions for which it is not fitted.

Plan B. The replenishment of material is regulated by the amount available. The balance sheet presented in Fig. 3 is the one needed for major materials in the over-whelming majority of manufacturing plants, since most factories have a fluctuating rate of use. This plan has been in operation in many plants for a number of years, and has proved entirely satisfactory under conditions to which it was adapted. Its use is rapidly increasing. It is unnecessary to state that the sheet is not suitable for all manufacturing plants in the particular form here presented, although it has proved of very wide applicability. Comparatively slight modifications will adapt it to almost any type of industry.

The only situation where the use of plan *B* balance sheet is unnecessary is when we have conditions described in plan *A*, and sometimes in plan *C*, conditions vary rarely encountered. This balance sheet is, moreover, suitable for use under plan *A*, since all that is necessary in such a case is to use the first two columns. It can be used under plan *C* with certain additions.

Before considering the details of this particular sheet, it is well to review its general function in material regulation. A satisfactory regulation of materials under this plan of operation presupposes the ability to answer almost immediately the questions following. Such information may and should be embodied in one central place, the balance sheet.

(1) How much has been ordered?
(2) When was it ordered?
(3) The replenishment order number?
(4) The purchase order number?

(5) How much has been received?

(6) How much is still outstanding on the purchase order?

(7) How much does the balance sheet show is now in the bin, and how does this compare with the amount actually in the bin?

(8) What has been issued, and for what purpose was it issued?

(9) What has been returned as credit, and what order or account was credited with the amount and value of the return?

(10) The total value of material on hand, including the transportation charges where practicable?

(11) The unit value of material on hand, including the transportation charges where practicable?

(12) What has been apportioned or set aside for manufacturing or other needs?

(13) When was it so apportioned?

(14) For what purpose was it apportioned?

(15) How much, if any, has already been issued against this reservation?

(16) The balance still on apportionment?

(17) How much is still available for apportionment to other orders?

(18) When did it become so available?

Besides furnishing answers to these questions, the balance sheet must:

(a) Be easy to operate.

(b) Be up to the minute in record of transactions.

(c) Provide an easy means of tracing each transaction.

(d) Enable the compilation of statistics covering the rate of use, the time necessary to renew the supply, the cost, and other information.

(e) Provide a means for checking the clerical accuracy of the entry and balances.

What the Balance Clerk Must Do

In order that answers to these questions may be instantly available, around the balance sheet must revolve the procedure following. The topics are numbered to correspond with and answer the preceding list of questions.

(1), (2), (3) The replenishment orders must be originated by the balance clerk or must pass through his hands for entry. Besides the amount ordered, on the sheet must also be noted the date the replenishment order was issued and the replenishment order number for identification.

(4) Upon the issuance of the purchase order, a copy must be sent to the balance clerk showing the amount actually ordered. This must be checked with the amount ordered as per the replenishment order, and any necessary adjustments made. The purchase order number must also be entered for identification.

(5) Upon the receipt of a shipment, a notification of the materials received must be sent to the balance clerk. This must be identified with the purchase order, and must show the amount actually received, and if convenient, also the amount passed and the amount rejected upon inspection, although this information may be sent forward later. It is important that the notification of the materials received go forward just as promptly as possible after the shipment is in, since requests for the issuance of material not on hand lodge with the balance clerk until they may be filled.

(6) Notification of the cancellation of purchase orders or of parts of purchase orders must be sent to the balance clerk so that in conjunction with the notation of orders and of receipts a running balance of the amounts still due may be kept.

(7) Stock count is the result of an actual physical count by the storekeeper or his representative for the item, and is made entirely independent of any knowledge of the balance as shown on the balance sheet for that item. This is one of the means by which accuracy of the perpetual inventory may be maintained. Such count may be made on a few items daily so that in the course of at least four or five months the whole storeroom may be covered, and then the process is repeated.

(8) The balance clerk must record the stores and worked material issues which have been filled, showing the amount actually taken from the storeroom and issued to the shop or other departments. These may show also, if desirable, the remaining balance in the bin after such issues have been subtracted, as an additional current check on inventory.

(9) The stores and worked material credits must be sent to the balance clerk showing the amount of goods actually returned to the storeroom as a credit to some previously debited charge account.

(10) and (11) The balance clerk should secure the original or duplicate invoice, showing the purchase price of the goods and the record of express or freight, or other transportation charges against the shipment. Dividing the total cost, including these transportation charges, by the number of articles on hand, gives the unit cost.

(12), (13), and (14) Bills of material, manufacturing orders, stores issues, worked material issues, or other forms of information, showing what materials and how much will be needed in the future for manufacturing or other needs must be recorded by the balance clerk. This information is for the purpose of apportioning such demands against the material. Such information must include, for entry on the sheet, the date of these requests, and the account number or symbol to which supplies are to be charged when finally issued.

(15) From No. 8 above, after passing through the storeroom for issue, is obtained and entered what has actually been issued for this use.

(16) By subtraction is obtained the total amount outstanding on apportionment after deducting this particular issue. This total should be entered.

(17) and (18) By subtraction the amount still available is found and should be entered with the date it became available.

To make such a record intelligible:

(a) The sheet must be so arranged as to be readily understood and followed.

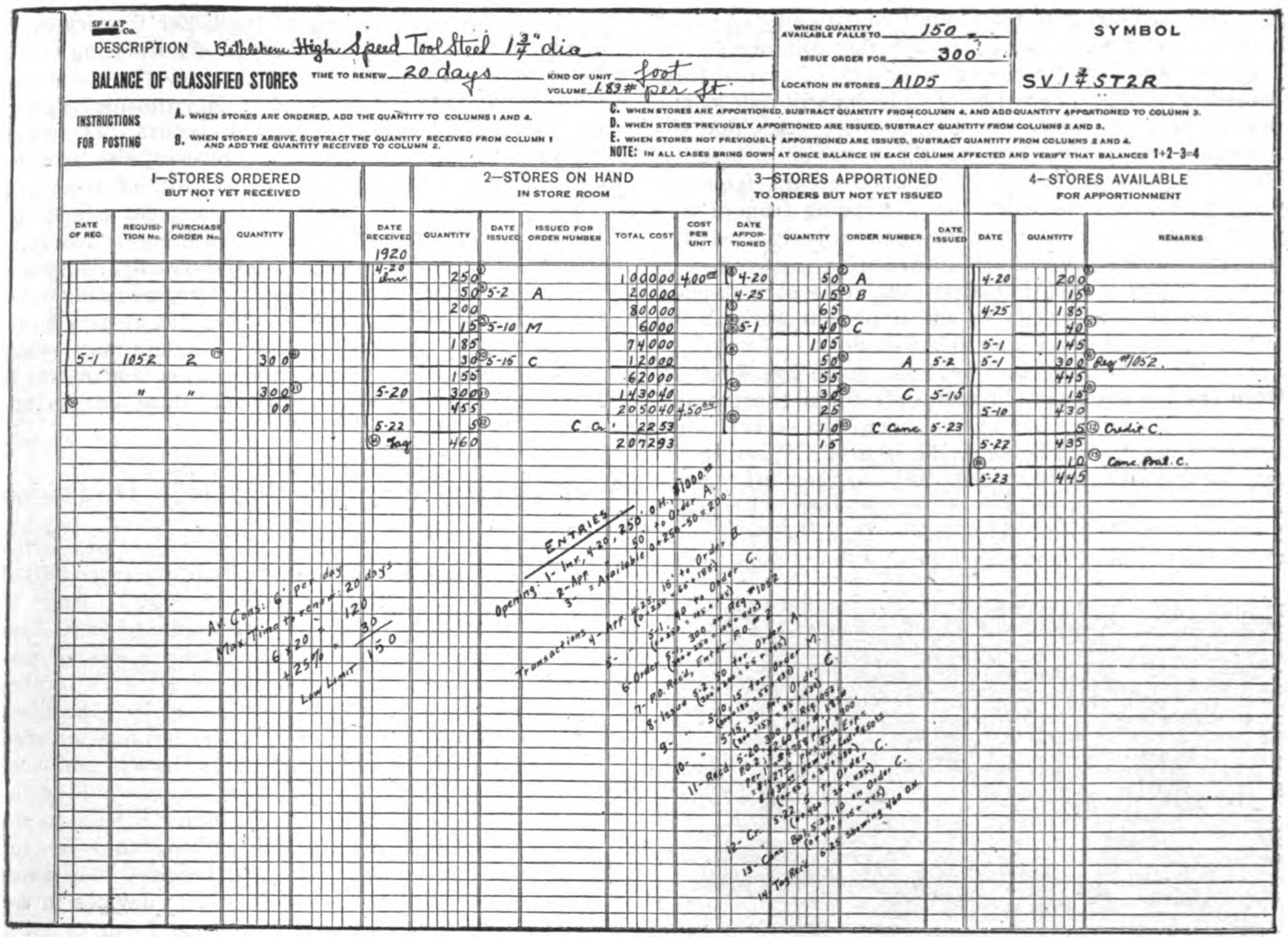
(b) There must be a continuous flow of such records currently through the balance sheet.

(c) Each transaction must be complete in itself and so entered, complete identification of each entry being insisted upon.

(d) The balance sheet must form a permanent record.

(e) The balances of the amount ordered, plus the amount on hand, minus the amount apportioned, must equal the amount available at any time.

In order to conform to all of these requirements, the balance sheet must have a minimum of four columns, one for entries relating to orders, the second for entries relating to amounts on hand, the third for amounts apportioned, and the fourth for amounts available. Although extremely common, the four-column balance sheet is by no means universal for this purpose,



SF & AP [redacted] Co.

DESCRIPTION Bethlehem High Speed Tool Steel 1¾" dia

BALANCE OF CLASSIFIED STORES TIME TO RENEW 20 days KIND OF UNIT foot VOLUME 1.83# per ft.

WHEN QUANTITY AVAILABLE FALLS TO 150 ISSUE ORDER FOR 300 LOCATION IN STORES A1D5

SYMBOL SV 1¾ ST2R

INSTRUCTIONS FOR POSTING

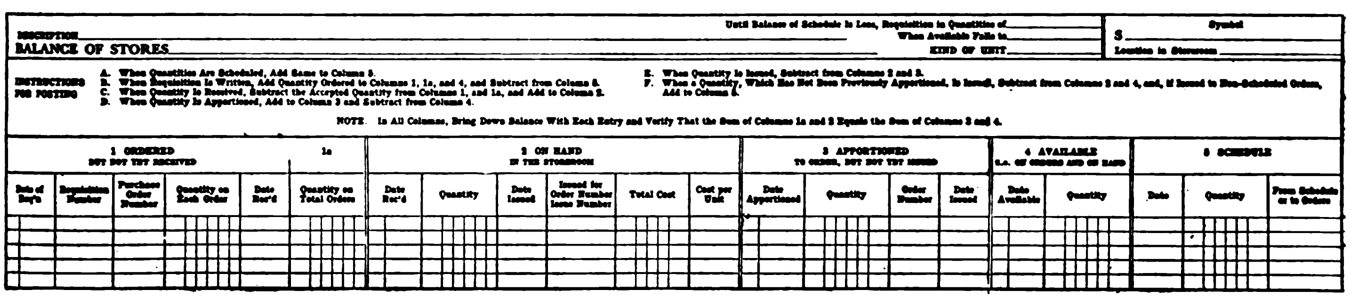
A. WHEN STORES ARE ORDERED, ADD THE QUANTITY TO COLUMNS 1 AND 4.
B. WHEN STORES ARRIVE, SUBTRACT THE QUANTITY RECEIVED FROM COLUMN 1 AND ADD THE QUANTITY RECEIVED TO COLUMN 2.
C. WHEN STORES ARE APPORTIONED, SUBTRACT QUANTITY FROM COLUMN 4, AND ADD QUANTITY APPORTIONED TO COLUMN 3.
D. WHEN STORES PREVIOUSLY APPORTIONED ARE ISSUED, SUBTRACT QUANTITY FROM COLUMNS 2 AND 3.
E. WHEN STORES NOT PREVIOUSLY APPORTIONED ARE ISSUED, SUBTRACT QUANTITY FROM COLUMNS 2 AND 4.
NOTE: IN ALL CASES BRING DOWN AT ONCE BALANCE IN EACH COLUMN AFFECTED AND VERIFY THAT BALANCES 1+2-3=4

1—STORES ORDERED BUT NOT YET RECEIVED				2—STORES ON HAND IN STORE ROOM						3—STORES APPORTIONED TO ORDERS BUT NOT YET ISSUED				4—STORES AVAILABLE FOR APPORTIONMENT		
DATE OF REQ.	REQUISITION No.	PURCHASE ORDER No.	QUANTITY	DATE RECEIVED 1920	QUANTITY	DATE ISSUED	ISSUED FOR ORDER NUMBER	TOTAL COST	COST PER UNIT	DATE APPORTIONED	QUANTITY	ORDER NUMBER	DATE ISSUED	DATE	QUANTITY	REMARKS
				4-20 Inv.	250			1000.00	4.00	4-20	50	A		4-20	200	
					50	5-2	A	200.00		4-25	15	B			15	
					200			800.00			65			4-25	185	
					15	5-10	M	60.00		5-1	40	C			40	
					185			740.00			105			5-1	145	
5-1	1052	2	300		30	5-15	C	120.00			50	A	5-2	5-1	300	Req #1052.
					155			620.00			55				445	
	"	"	300	5-20	300			1430.40			30	C	5-15		15	
			00		455			2050.40	4.50		25			5-10	430	
				5-22	5		C Cr.	22.53			10	C Canc.	5-23		5	Credit C.
				Tag	460			2072.93			15			5-22	435	
															10	Canc. Bal. C.
														5-23	445	

Av. Cons. 6' per day
Max. Time to renew 20 days
6 × 20 = 120
+25% = 30
Low Limit 150

ENTRIES
Opening: 1- Inv. 4-20, 250' O.H. $1000.00
2- App. 50' to Order A
3- Available 250-50=200

FIG. 3. PLAN *B*, BALANCE SHEET FOR REPLENISHMENT BY AMOUNT AVAILABLE



DESCRIPTION
BALANCE OF STORES

Until Balance of Schedule is Less, Requisition in Quantities of
When Available Falls to
KIND OF UNIT

Symbol S
Location in Storeroom

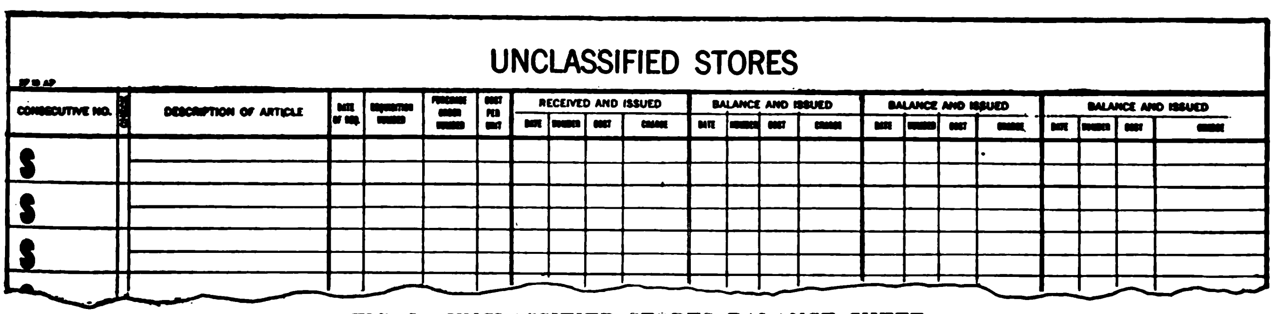
INSTRUCTIONS FOR POSTING

A. When Quantities Are Scheduled, Add Same to Column 5.
B. When Requisition Is Written, Add Quantity Ordered to Columns 1, 1a, and 4, and Subtract from Column 5.
C. When Quantity Is Received, Subtract the Accepted Quantity from Columns 1, and 1a, and Add to Column 2.
D. When Quantity Is Apportioned, Add to Column 3 and Subtract from Column 4.
E. When Quantity Is Issued, Subtract from Columns 2 and 3.
F. When a Quantity, Which Has Not Been Previously Apportioned, Is Issued, Subtract from Columns 2 and 4, and, if Issued to Non-Scheduled Orders, Add to Column 5.

NOTE. In All Columns, Bring Down Balance With Each Entry and Verify That the Sum of Columns 1a and 2 Equals the Sum of Columns 3 and 4.

1 ORDERED BUT NOT YET RECEIVED					1a	2 ON HAND IN THE STOREROOM						3 APPORTIONED TO ORDER, BUT NOT YET ISSUED				4 AVAILABLE S.A. OF ORDERS AND ON HAND		5 SCHEDULE		
Date of Req'n	Requisition Number	Purchase Order Number	Quantity on Each Order	Date Rec'd	Quantity on Total Orders	Date Rec'd	Quantity	Date Issued	Issued for Order Number Issue Number	Total Cost	Cost per Unit	Date Apportioned	Quantity	Order Number	Date Issued	Date Available	Quantity	Date	Quantity	From Schedule or to Orders

FIG. 4. PLAN *C*, BALANCE SHEET FOR REPLENISHMENT BY SCHEDULE



UNCLASSIFIED STORES

SF & AP

CONSECUTIVE NO.		DESCRIPTION OF ARTICLE	DATE OF REQ.	REQUISITION NUMBER	PURCHASE ORDER NUMBER	COST PER UNIT	RECEIVED AND ISSUED				BALANCE AND ISSUED				BALANCE AND ISSUED				BALANCE AND ISSUED			
							DATE	NUMBER	COST	CHARGE	DATE	NUMBER	COST	CHARGE	DATE	NUMBER	COST	CHARGE	DATE	NUMBER	COST	CHARGE
S																						
S																						
S																						

FIG. 5. UNCLASSIFIED STORES BALANCE SHEET

and various numbers of columns from four to possibly a dozen are encountered.

In the more elaborate and clumsy sheets, I have never found features embodied which could not be incorporated in the four-column sheet. For clearness, for a small amount of clerical work, and for the general ease of operation, it is usually to be preferred. The objection most generally made to it is that it does not provide separate columns for the entry of the amount received, the amount issued and the amount still on hand, for ease in tabulation. As can be seen on the sheet in Fig. 3, however, each of these entries may be readily picked out

by paying attention to the respective date entries which identify each transaction in the different columns.

A review of the preceding summary of transactions necessary to the operation of this balance sheet will immediately emphasize the point so often made that the balance clerk is the hub of the material procedure. Hardly a transaction of importance occurs from replenishment to issue which does not spring from or lead to the balance sheets, and if they are properly used they constitute an encyclopedia of information to anyone who desires to know anything about the state of materials. It should be unnecessary to add that such work should not be intrusted to an inexperienced clerk.

Plan C. The replenishment is made by schedule. Once the requirements in materials for a considerable period in the future are known, there are several ways in which the desired flow may be secured. Where plans may be followed without variation, the simplest method is to list or put on ticklers the dates when the various purchases are to be made. This method, however, provides for no follow-up in case production becomes more

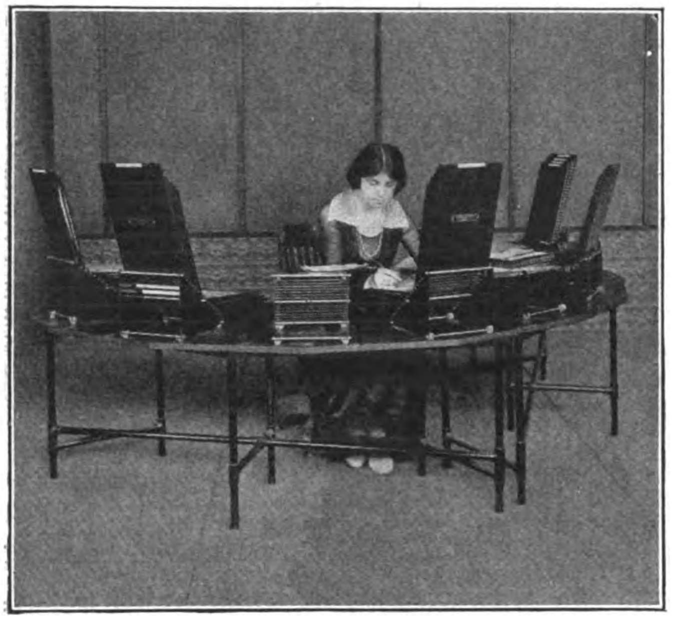


FIG. 6. ARRANGEMENT FOR 5,000 BALANCE SHEETS

or less than planned. In such cases the balance sheet described for Plan *A* may be satisfactory to use where production is not too irregular. The balance sheet illustrated in Fig. 4 may be more serviceable where we can look ahead a long time but where the rate of production is not predictable. This sheet is similar to that of Plan *B*, with the addition of a schedule column.

A balance sheet for classified worked materials in design and operation may in some cases be very similar to that of the stores, while in other cases the need may be felt for two additional columns.

Unclassified Stores.—Little need be said in regard to the balance sheet for unclassified stores, since its operation will be entirely clear from the sample sheet shown in Fig. 5. This is used only for items which are not regularly stocked, but which are ordered for special purposes and ordinarily issued for those purposes just as soon as received. This sheet should be inspected from time to time to catch recurring items which may be transferred to the classified list and kept in stock.

Although loose cards of various sizes instead of sheets are frequently found in use in balance record files, it is felt that in general the use of the latter is much safer and more satisfactory. The danger of misplacing a card where there are possibly 30,000 items in the storeroom, each requiring at least one card, is very considerable and causes extreme annoyance when it occurs. Loose-leaf binders of this number of sheets, however, also have the disadvantage of taking up a great deal of room and of being either heavy or involving a great number of volumes. Some of the improved card-filing devices remedy both of these defects quite satisfactorily. Figure 6 shows a compact arrangement accommodating over 5,000 separate balance sheets. This file gives a maximum number of sheets or cards in a minimum space, makes it impossible to misplace a card, and makes it unnecessary to lift heavy volumes since entries are made in position.

Who Remembers This Bicycle?—Discussion

By Albert A. Bailley

In an article under the above title on page 381 of AMERICAN MACHINIST, I. B. Rich is quite correct in stating that shafts with multiple splines were used before the days of the automobile; also in stating that this method was used in the construction of a bicycle.

The 1896 model Tribune bicycle, made by the Black Manufacturing Co., Erie, Pa., had its cranks attached to the shaft in this manner. I distinctly remember this, because I ground the cutters used in milling the broaches. Mr. Rich's friends evidently belong to the younger set, who think that everything they see for the first time is new and original because they never saw it before. But there are very few devices in use today that have not appeared in some form or other many years ago.

I was at one time employed by an old-time concern that started in business in the early part of the nineteenth century. About 1904 this firm happened to be hard pressed for cash, and as a last resort decided to cash in on a scrap pile that had been growing in the basement for about fifty years. At the bottom of this scrap heap was found a large black walnut toolchest. On being opened this chest disclosed the fact that it had belonged to a man named Mudge who flourished about 1841, some of the tools being marked with the name and date.

This man Mudge was evidently a genius and an excellent mechanic, as the chest contained many clever specimens of his handiwork. Among the contents were an adjustable spirit level, very similar to the best adjustable levels on the market today, a clamp lathe-dog which to my knowledge has been re-invented many times since, a number of hand-made skew gears, not very accurate as gears, but good specimens of hammer and chisel and file work.

There was also a partly finished piece having a stud with V-shaped serrations, exactly as referred to by Mr. Rich. In this case the stud was made of tool steel and hardened and made to act as its own broach. The end was made slightly tapering and the serrations were pressed instead of being cut in the hole, though the hole appeared as if broached.

A method resembling this has been used for a good many years, in holding the crossbars in chuck wrenches and T-tap wrenches, excepting that the serrations were produced with a knurling tool, and the parts are not hardened.

The Mack Truck Frame and Chassis

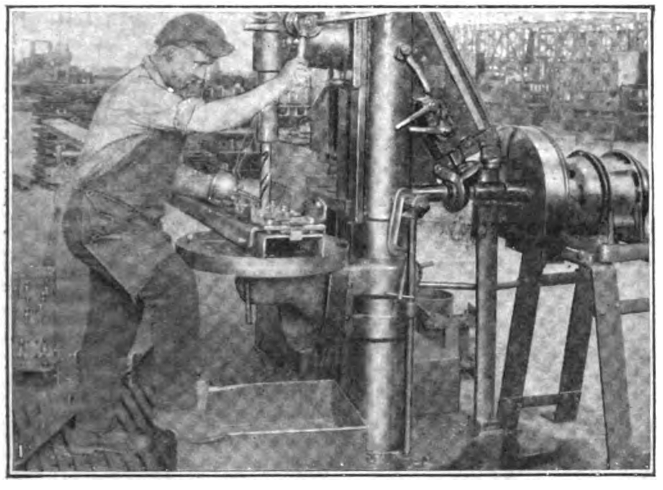
Drilling and Riveting the Frame—Rivets Heated by Electricity—Motor Storage Racks—Final Assembly of Complete Truck Chassis

By FRED H. COLVIN
Editor, *American Machinist*

THE channels which comprise the side frames are drilled with reversible drilling fixtures as shown in Figs. 1 and 2. These fixtures are located from the ends of the channels and are held against side movement by setscrews when necessary. Both Figs. 1 and 2 show different applications of motor drives to two drilling machines. In the case of Fig. 1 the motor is mounted on a neat stand. The reducing gears are enclosed in both cases.

The riveting of the frame shows in Fig. 3, how the four men work together in handling this work quickly. The man in the center puts in and removes the temporary bolts for holding the frame in position while the first few rivets are being driven. Two others handle the riveting hammer and "holder on" while the fourth man keeps them supplied with hot rivets heated in the electric furnace shown. It is only necessary to place the rivets between the contact points of the heater and they are automatically, quickly, and uniformly heated. The pedal opens the contact for placing and removing the rivets.

Occasionally additional drilling needs to be done, as shown in Fig. 4. An air drill is used for this purpose and the "old man" or support shown has proved to be very convenient. It consists of a U-shaped piece of bar iron with hooks on the end and the legs given a quarter turn as shown. This device is very convenient and saves considerable work on the part of the operator, as the side bars take the turning reaction from the drill cut. At the outer end is a substantial wooden block *A*, which carries the drills needed in suitable holes.



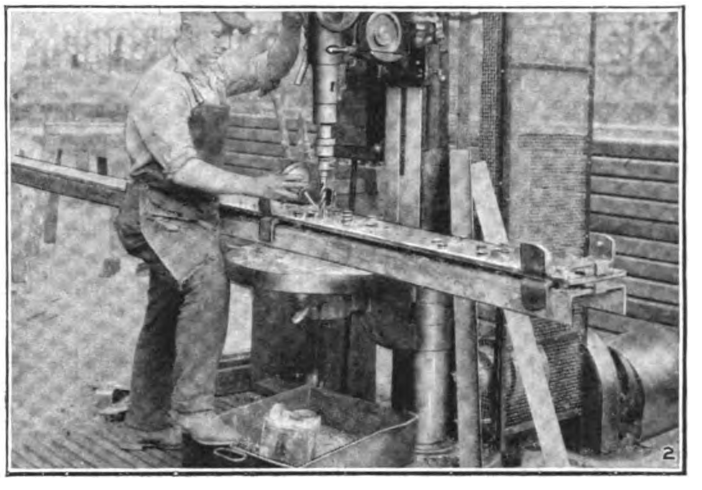
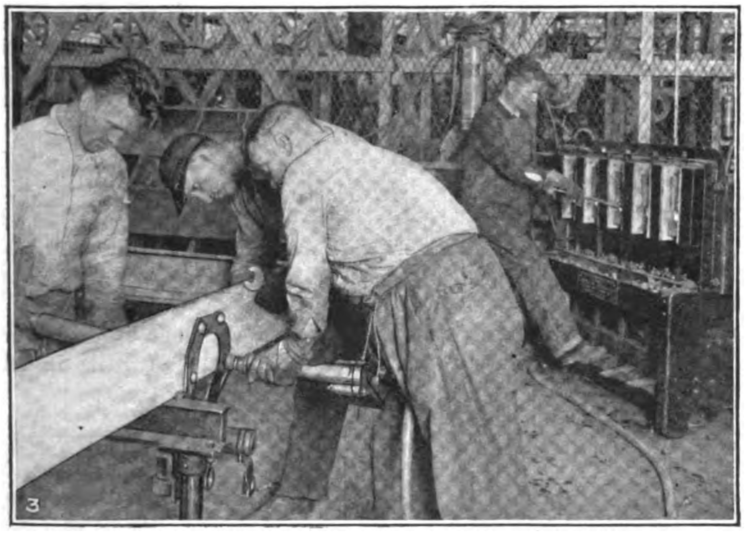


FIG. 1. DRILLING THE FRAME. FIG. 2. THE DRILLING FIXTURE



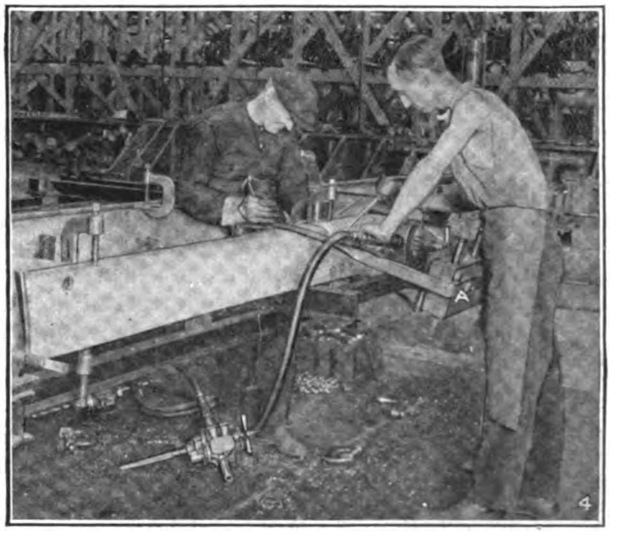
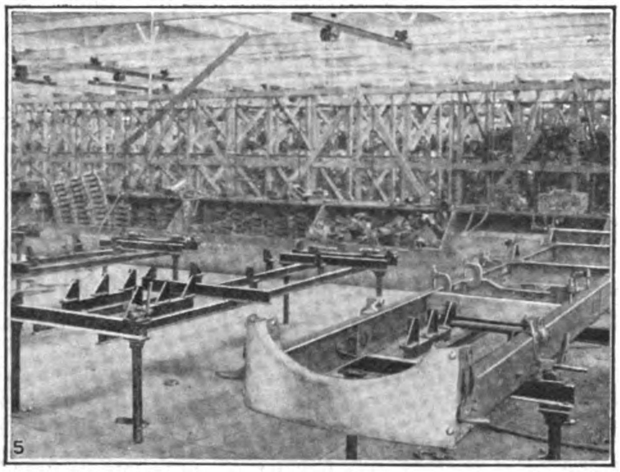


FIG. 3. RIVETING THE FRAME. FIG. 4. DRILLING ADDITIONAL HOLES

In Fig. 5 is shown the type of stands used in assembling the frame, and also a frame partially completed, including the heavy end cross-members which carry the side hooks for towing or being towed.

In the background is seen part of the motor storage,



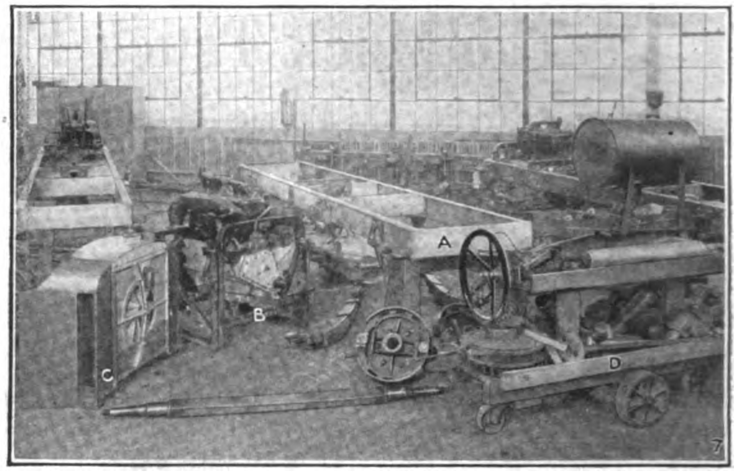


FIG. 5. THE ASSEMBLY STAND. FIG. 7. PARTS READY FOR ASSEMBLY

a closer view of which is shown in Fig. 6. This view gives some idea of the capacity of the assembling plant at the Allentown shop and shows the systematic manner in which the parts are stored. Suitable provision is made for handling the motors to and from the racks, and one of the trucks used is shown in the next cross aisle. This rack has a storage capacity for several hundred motors which are received from the plant in Plainfield, N. J.

The Assembly Floor

In Figs. 7, 8 and 9 are shown three views of the assembly floor. In Fig. 7 the frame has just been placed at *A*, the motor in its stand at *B*, a complete radiator unit at *C*, and a truckload of parts at *D*. These trucks are filled in the stock department with just the right number of parts to complete a truck assembly. This saves running back and forth to the storeroom and also the loss due to parts becoming mislaid, or tucked away under benches, as was too often the case under old methods in many shops. Springs, axles and other parts are shown convenient for the assembly and the work proceeds very rapidly when an assembly gang moves to a new frame.

Another view of the assembly line, showing the motors, trucks and various parts in different stages, is seen in Fig. 8. It also gives an excellent idea of the layout of the shop, the system of monorail hoists and the splendid lighting, both from the side windows and the construction of the roof.

In Fig. 9 is shown a truck chassis of the chain drive type nearly assembled. Careful provisions are made both for the safety of the men and the expediting of the work and when a truck frame reaches the assembly floor it is a comparatively short time before it is completely assembled and ready to drive out for its road test and to receive the body which is to be supplied.

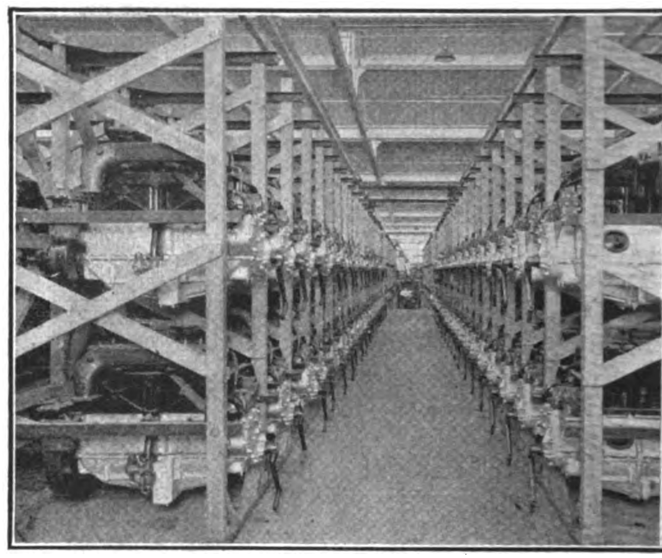
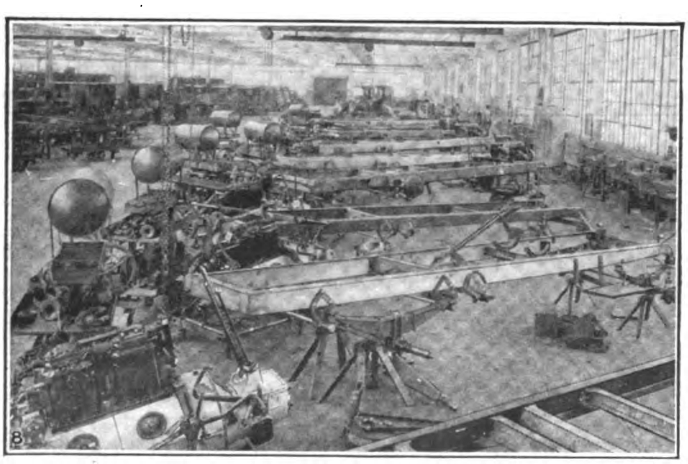


FIG. 6. MOTOR STORAGE RACK

Allentown, incidentally, affords an excellent opportunity for testing trucks as it has a variety of hills in all directions.



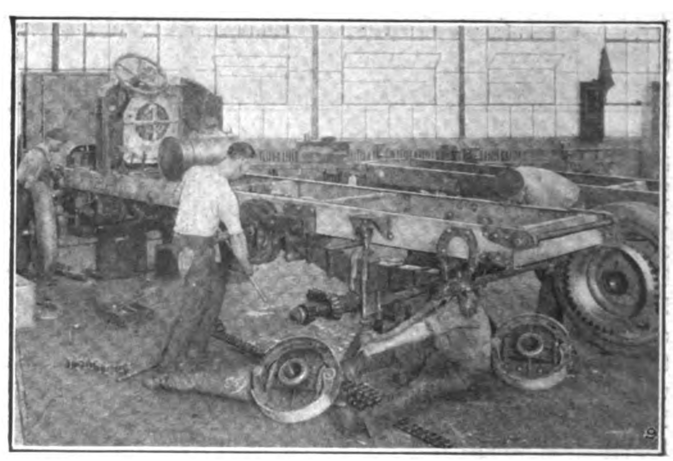


FIG. 8. THE ASSEMBLY LINE. FIG. 9. PUTTING THE TRUCK TOGETHER

The Maintenance of Textile Machinery

Purpose of Ball Bearings and Importance of Proper Lubrication—Common Abuses and Suggested Corrections

By EDWIN H. MARBLE
President, Curtis & Marble Machine Co., Worcester, Mass.

A MEMBER of a well-known firm of appraisal engineers recently stated that it was not practical to adjust values of textile machinery by any known annual depreciation percentages. Two machines placed in operation in different mills, receiving attention or lack of attention, will be represented on the valuation sheet by quite varying figures. It is the hope of the writer of this paper that some suggestion may be made that will bring the two valuations nearer together and assist in a better maintenance of the textile machinery that has been installed in so many of the mills.

We will take for specific illustrations that class of machines with which the writer is most familiar, namely, cloth-room machinery. The suggestions, however, will apply equally well to most of the machinery found in our textile mills. When machinery is being constructed by the builder, the frame is carefully leveled and the various bearings are adjusted and the machine, when placed in its proper position on the mill floor, should be carefully leveled and then securely fastened in its position. Several times we have had called to our attention a very careless carrying out of this suggestion. "The legs seem to be firm on the floor and the machine must be all right," was the report. This leveling is particularly important with machinery that has considerable length along the line of the main driving shaft, such as spinning frames, or with machines that have fine adjustments, such as shearing machines. Having attended to this particular feature at the installation of the machines it is well to repeatedly test out the stability of the leveling.

With the machine in position and various attachments and revolving parts in place, see that the bearings are not too snug and that each roll or shaft turns freely. We all expect a certain degree of stiffness in new machines and no matter how finely the builder may have made his fits, the transferring of the machine from one floor to another will have varied the adjustment to some extent.

The Importance of Lubrication

With the machine starting off smoothly, what suggestions can we make to assist in maintaining its operating condition? Lubrication is possibly one of the prime considerations. Often it is no oil, an unstable oil, or a surplus of oil. The same oil cannot well be used on the high-speed spindle and the slow-revolving main shaft. The type of bearing may not be suitable for some of the heavy non-fluid oils. A regular system of oiling up should be practiced. Every morning the operator should see that any exposed oil holes are carefully cleared out and enough suitable oil applied to lubricate each bearing.

On many textile machines you will find ball bearings of various makes and they require considerable attention. First, we would ask why these particular devices were installed. Reducing all the answers to their lowest terms we find three reasons; they reduce bearing friction and save horsepower; they render good service by the saving of oiling troubles; or they were installed because some salesman convinced some one that he had a panacea for most of the ills mechanical devices are troubled with. The first answer is a rather limited one, for while the actual saving of horsepower is in many cases quite an item, the application of ball bearings to a particular revolving body should be considered carefully and the condition of working load examined and charted before any new installations are made.

In almost all cases the machine builder has looked the designing of his machine over pretty carefully before he has sent it out and is a fairly good judge of when and what kind of a friction-reducing bearing can be used to advantage.

Lubrication of Ball Bearings

Now regarding the second reason, which concerns the lubrication side of the ball-bearing question, any ordinary bearing must be oiled frequently. The installation of a proper ball bearing will in many cases reduce to a considerable extent both the time required to oil and the amount of oil used. The frequent oiling of ordinary bearings oftentimes breeds carelessness, and the surplus oil, conveyed to stock or fabric, produces damaged goods. This can be prevented in a great measure by a careful consideration of the application of a suitable friction or lubricant-retaining bearing.

Do not for one moment think your troubles are ended when your ball bearing is installed. A ball bearing allowed to run dry can do as much damage as can any other type of dry-running bearing, and perhaps from a financial point of view much more damage. We can not attempt to tell how often a ball bearing should be repacked with suitable heavy oil or grease. The load under which it runs, the speed of the shaft and type of lubricant-retaining washers or felt that is used, all have an influence on this. Three or four times a year may be necessary for one bearing, while another bearing can be allowed to run for six months without injury. But plainly speaking, every bearing must receive attention or your maintenance costs mount upward rapidly.

In the textile industry more than in any other, the ball-bearing salesman seems to have found a large number of gullible customers. Draft rolls on a cotton-brushing machine, approximately 1¼ in. in diameter, revolving 60 to 100 turns per minute, have been equipped with expensive self-alignment, self-adjusting, felt-washered, oil-retaining bearings, guaranteed to reduce the horsepower required to run the machine from 30 to 50 per cent. The large percentage of the horsepower required is consumed in drawing the cloth through the machine. The friction load on the bearing is very small and rarely have we seen any noticeable saving in power by such an application. On the other hand we have noticed on some machines ball bearings subjected to a heavy working load that have failed to stand

Paper presented at the spring meeting, Atlanta, Ga., May 8 to 11, 1922, of the American Society of Mechanical Engineers.

up. This was due to misunderstanding the conditions or being afraid to ask a high price for the installation, so the salesman had equipped the machines with bearings much too light for the duty required. Hence when in doubt about ball-bearing equipment on an old type of textile machine, ask the maker.

Many machines receive power in some of their parts through friction clutches, and few mechanical movements have been subjected to so much abuse as have these devices. From a standing position you throw into action from ½ to 10 hp. and expect an immediate response at approximately full speed. Promptness of action is demanded, yet little attention is given to the mechanism that must respond to the demand. The cone, or actuating part, is probably scored by the lever being too tightly pressed against it; as the clutch is handled the starting load is in excess of the best efforts of the friction band. Most clutches are designed to produce a pressure rapidly increasing toward the end of movement, yet the movement is often so rapid that the start is not made until the extreme throw is completed. Through severe use the friction-creating surfaces are roughened so that instead of a gradually increasing friction application, the action is a grip or bite, demanding an immediate response on the part of the standing portion. Every application of the lever increases the roughness and necessitates more serious consideration of the remedy which eventually must be applied.

Give a little attention to the friction creating surfaces, cleaning them of gum or grease, smoothing any irregularities that may have been formed and particularly adjusting the toggle or connecting unit between the cone or actuating part. In fact, see that the clutch, as a whole, is in condition to respond to the call for its services. You are not dealing with a yielding movement like a leather belt, but rather a somewhat rigid device that depends on the frictional contact between two metallic surfaces for the transmission of energy—a splendid device when properly cared for, but usually one of the most abused attachments on any textile machine.

Belting in a Textile Plant

The moment any one says, "use belting in a textile plant," some one else has his dissenting viewpoint. Every belt has to adjust itself in passing over a pulley, according to its thickness and flexibility. A stiff, thick belt on a small pulley is giving the operator about 60 per cent of the value of the proper belt. An overcrowned pulley of small diameter is another loss of power. That any piece of leather or perhaps canvas is good enough to transmit power, seems to be the idea of some of those in charge of textile plants, and one will find stiff and non-flexible belting being used to transmit power to a series of rollers at high speed and equipped with comparatively small pulleys. The result is that the belt will not conform to the arc of the pulley and hardly has time to straighten itself after leaving one curved surface before it must reverse its curvature in going around a second pulley. A pliable single belt of good quality will transmit more power and maintain more uniform speed. Then belts are often put on with little attention to conditions. The leather is stiff, dry and without flexibility and the belts are united by heavy hooks or plates, driven into the leather, with the ends probably not cut off square, so that the joint is irregular.

Perhaps a final word will suffice about belt hooks, lacing, plates or other means of connecting the ends of belts. The nearer the joint is to the thickness of the belt and the more flexible its character the better. How many machines are deprived of much of their usefulness by a disregard of the small things which enter into their construction. A thumbscrew may hold some attachment in position; it is lost and a piece of string or frequently a strip of cloth is used in its place. This makeshift is so inadequate that more or less loose motion continually takes place, and due to the resulting constant wear the attachment is soon either discarded or becomes inoperative. A cover is flopping about because some one broke the hinge or tore it from the wood or ironwork. Even a belt shipper is rendered unsafe by the wearing of the retaining section. We find shipper levers retained in place by a stick or block or wood and the discovery of this condition by a safety inspector prevented serious accidents in two cases known to the writer. "A stitch in time save nine" can be applied to mechanical devices as well as to a pair of trousers.

The Treatment of Bearings

Have you ever noticed the treatment which bearings receive in different textile plants? A driving shaft of suitable size has been installed on a machine by the maker. It is subjected to some hard usage, runs at a somewhat high speed and is carried in well fitted bearings lined with some anti-friction or babbitt metal. It may have been $1\frac{15}{16}$ in. in diameter originally, but neglected by the oiler both the shaft and babbitt eventually wear down and you have perhaps a $1\frac{13}{16}$-in. shaft running in an oblong hole 2 x $2\frac{1}{8}$ in. The result is a worn shaft wobbling around in a somewhat restricted space. At last the operator or foreman succeeds in calling a mechanic's attention to the condition and when the latter has time he takes out the shaft, removes it to the machine shop, finds it is out of round, turns it over to any odd size, takes off the bearings, knocks out the old babbitt and proceeds to rig up some blocking to rebabbitt. Without taking pains to center the shaft or to line up the bearings, he pours in his metal, chips off the surplus and repeats the operation on the cap to the bearing. He then endeavors to replace the bearing in its old position, but as it is not true in alignment, he either packs up his bearing or the cap with cardboard or paper and finding he can turn the shaft in its revamped housing, goes off contented. Now this is not a notion or fiction, but has been found by the writer in more than one case.

Let us suggest a plan of procedure. Turn your shaft to some special size, and carefully center the shaft in the bearings while they are in position. Then pack up under the shaft so as not to occupy quite one-half of the bearing, pour your bearing, and repeat the operation with the cap, packing up the ears to the cap so as not to have a full half of the shaft in the cap. But remember one thing, the shaft that you use to babbitt the boxes in has been subjected to considerable heat. Take it back to the machine shop, true it up and then scrape your babbitted bearings to this straightened shaft until you have a good running fit. See that you have cut new oil grooves in both box and cap and on leaving your completed job, quietly suggest to the operator that a little more attention to lubrication would assist you indirectly.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Machining a 30-inch Pipe

By William G. Hammerstrom
Chief Engineer, Lynchburg Foundry Co.

In the first operation for machining the bell and spigot ends of a 30-in. flexible pipe, the outside of the bell is turned to exactly 44½ in. in diameter and 4 in. in width. An allowance is made on the inside diameter of the steel band to make a tight grip over the bell in shrinkage. In this machining, the straight spigot end is placed against the faceplate of the lathe and is secured by means of four chuck jaws. A specially designed cast-iron spider is placed on the inside of the bell supported against the lead ring, and is held against the inside wall by means of screws. The spindle of the tailstock is placed in the center of the spider and the outside of the bell is turned in the usual manner of turning in an engine lathe.

The machining of the inside lead ring is the second operation. To accomplish this, special tools and rigging are necessary. The carriage is first run up on the ways of the lathe and out of the way, since it is not used in this operation. The pipe is held in the chuck of the faceplate, as in the first operation, and a large, heavy steadyrest made in two halves is placed over the runways of the lathe, as shown in Fig. 1. The supporting arms of the steadyrest are brought up against the finished outside diameter of the pipe and adjusted until the pipe runs absolutely true. The arms are fitted with removable brass shoes.

A specially designed cast-iron stand is placed over the ways of the lathe in front of the bell. On the top of the stand is a large, integrally-cast hub bored out to take the spindle of the tailstock. In this way, the tool is rigidly held. A centrally pivoted arm moving radially on the top of the stand carries a small tool and is fed by means of a screw secured to the handwheel.

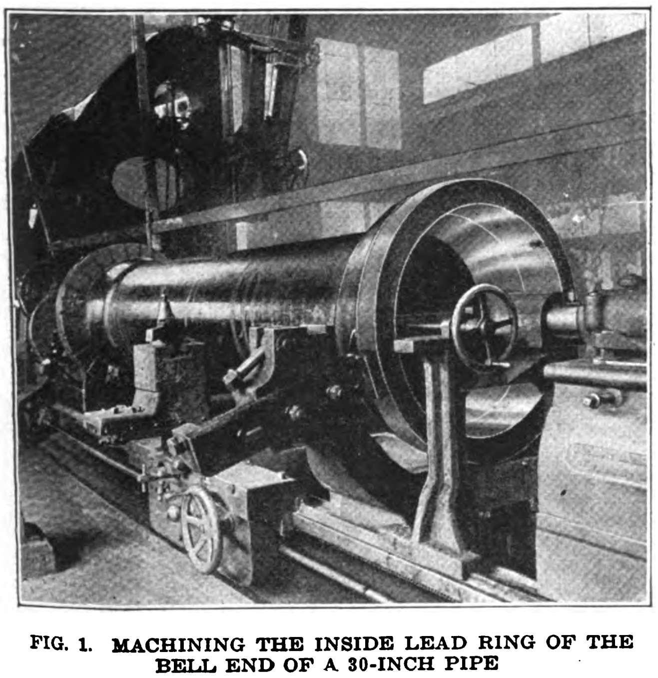


FIG. 1. MACHINING THE INSIDE LEAD RING OF THE BELL END OF A 30-INCH PIPE

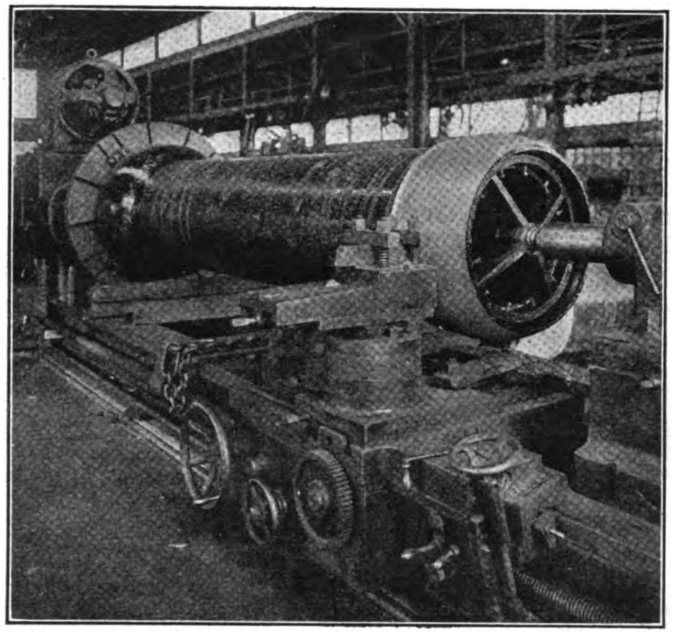


FIG. 2. MACHINING THE SPIGOT END OF A 30-INCH PIPE

The turning of the handwheel advances the arm and permits the tool to cut. The center of the arm is located accurately in relation to the face of the bell and is the same as the center of the ball of the spigot. The radius from the center of the arm to the point of the tool is also the same as the radius of the spigot.

These operations finish the machining of the bell end, after which the pipe is transferred to a 60-in., heavy, motor-driven, engine lathe for the machining of the spigot, as illustrated in Fig. 2. The spigot end is made straight to facilitate foundry practice and so it becomes necessary to remove no less than 400 lb. of surplus material in the form of heavy chips before the final finishing cuts are made. The pipe is placed in the lathe in the usual manner with the chucks on the faceplate gripping the inside of the bell while the spigot end is held by means of an inside spider.

To obtain an accurate spherical curvature of the spigot a cast-iron bridge is bolted to the outside way of the lathe, which clears the carriage and is long enough to permit the necessary horizontal travel of the carriage. A heavy forged steel link connects the bridge with the toolpost which is free to travel in a straight line towards the pipe. This link is fitted carefully to ground tapered screwed pins and is held by heavy nuts. The distance between the centers of the pins is equal to the radius of the ball on the spigot.

Placing the toolpost and tool carriage at the end of

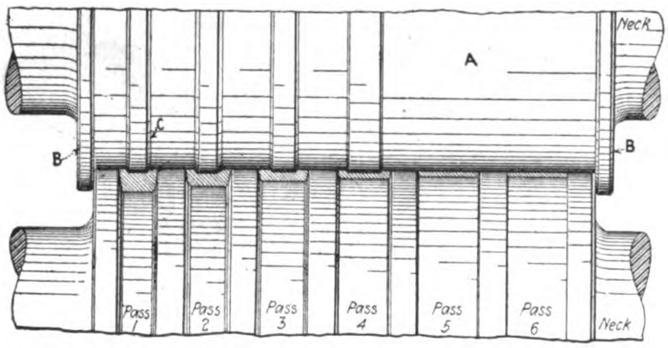
the spigot with the feed engaged, advances the carriage on the ways towards the headstock. Since the toolpost is free to move, the tool is held out by the link, making the outer radius until at the center the motion of the toolpost changes its direction and the tool is brought towards the pipe, thus forming the inner radius. The continuous motions make a perfect spherical surface. A light and final finishing cut is taken to make a smooth and even surface.

Rolls for Spreading Billets

By C. F. George

The rolls illustrated were designed especially for the spreading of square steel billets, an operation which is considered an impossibility by many steel manufacturers, it being a well-known fact that metal when rolled will elongate rather than spread.

With a set of these rolls it is possible for sheet manufacturers to buy square billets that were intended to make shells, heat them and roll them into flat plates for making sheet billets. With a proper arrangement of the mill these billets could be heated, rolled into plates, sheared and put through the sheet rolls all at one heating. The writer designed the rolls illustrated, had them made and was able to roll plates 6 in. wide by ½ in. thick in six passes from billets 3½ in. square.



ROLLS FOR SPREADING BILLETS

The top roll A has two end guides B and grooves or serations were cut across the projections C to provide the means of carrying the steel through the rolls. The square billet was heated and successively put through the passes, being turned over between each pass. The idea of this was so that the finished strip would have no raw edges, which would otherwise be the case, as the turning over process while rolling, kneads the raw edges into the bulk of the metal.

Making a Connecting-Rod Bearing

By Guy Cocklin

It may be of interest to know how I take care of orphan cars when they lose a bearing. I first get a couple of pieces of 2 x 4-in. hard wood, free from cracks or checks, or any pieces of wood that are suitable. I face one side of each so that they lie flat together as in Fig. 1. Next I chuck them in the lathe and bore a hole, slightly smaller than the crankpin; about 0.010 in. small will be found to be about right as the babbitt will pile up in the mold.

Then I take a sharp boring tool and bore out the form of the bearing in the wood (Fig. 2) to about 0.030 in. over the size of the connecting rod it is to fit. I take a piece of sheet iron of about No. 20 gage and make a trough and clamp it in the tool post so as to run the babbitt into the hole of the mold held in the

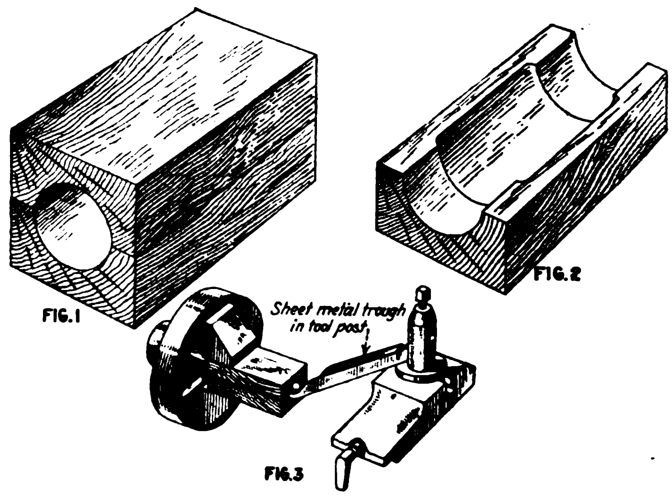


FIG. 1—THE BLOCKS BORED OUT. FIG. 2—THE RECESS FOR THE BEARING. FIG. 3—READY TO POUR THE BABBITT

chuck (Fig. 3) while the lathe is running about 1,000 r.p.m. When the hot babbitt is poured in, the centrifugal force throws the metal out into the form, leaving a hole slightly smaller than hole first bored in the block. When it hardens I bore inside of the bearing without removing the block from the chuck, then remove the blocks and take the bearing from the mold and place it on a mandrel. Finally I machine it to fit, cut the oil groove and saw in half.

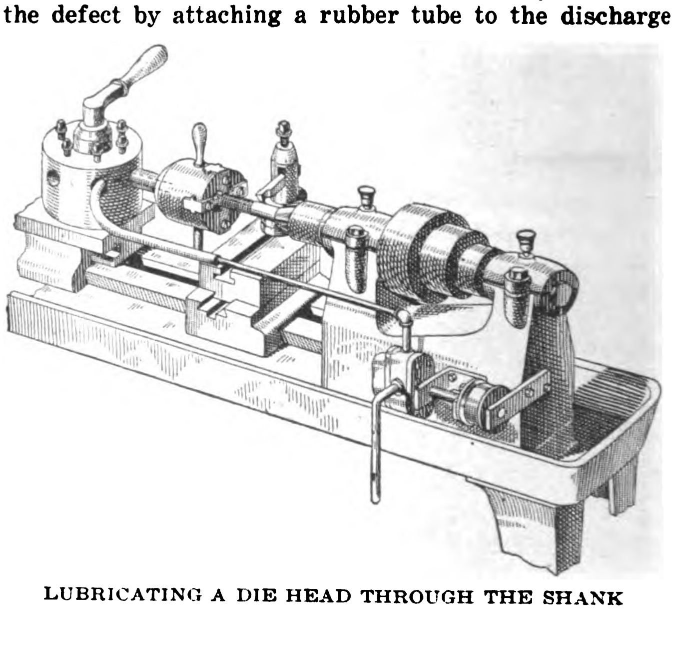
I have also found this method very satisfactory for replacing bearings on small electric motors that have babbitt bushings.

Novel Way of Getting Lubricant to a Die-Head

By Charles H. Willey

In cutting small studs upon the screw machine we had experienced considerable trouble from having the die load up and tear the threads, because of the difficulty of getting sufficient lubrication into the die.

The sketch shows how the foreman finally remedied the defect by attaching a rubber tube to the discharge



LUBRICATING A DIE HEAD THROUGH THE SHANK

side of the pump, leading it through one of the turret holes and into the rear end of the die-shank. The flood of lubrication flowing outward washed the chips clear of the die and we had no further trouble.

To Blueprint from Typewritten Sheets—Discussion

By A. A. Bertrand

A short article on page 420 of *American Machinist* entitled "To Blueprint from Typewritten Sheets," reminded the writer of an experience he had some years ago with a company which used as a shop form a blueprint made from a vandyke print.

This form was a material or parts list of the machine for the assembly department and its original was a typewritten sheet. It was our experience that no matter how we placed the carbon, we did not get the clear copies we desired, especially as we wanted a dark type on a light background. After considerable experimenting we found that by typing the sheets in a typewriter with a yellow ribbon we obtained a copy that made a very clear print.

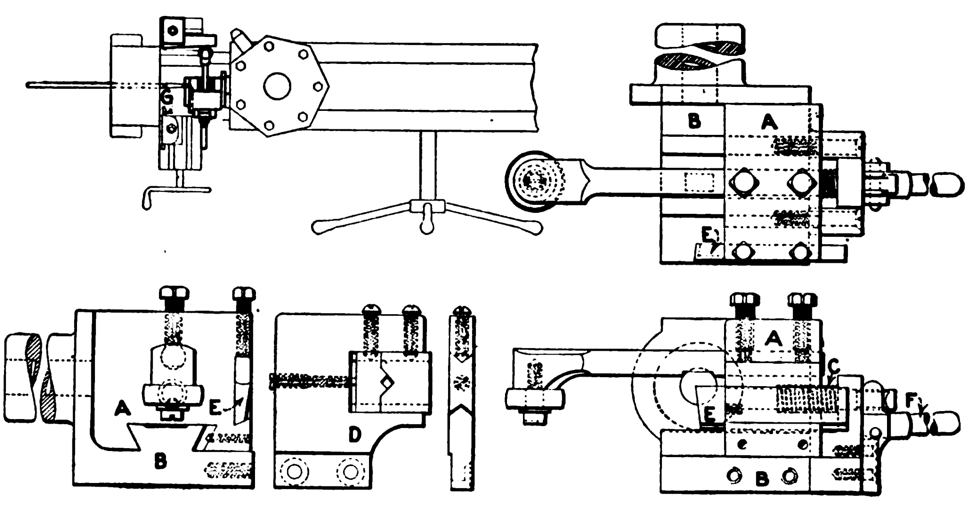
The writer has suggested this method to a number of people and they have been very much pleased with the results. To prove this method, it is only necessary to mark a paper with different colored pencils and make a print which will indicate the most satisfactory color.

Taper Pin Turning Attachment

By L. Boiselle
Courbevois, France

Having a large number of taper pins of various sizes to make, I worked out and made a taper pin turning attachment to be used on a Brown & Sharpe semi-automatic, which has given very good results as far as cost of production and quality of work are concerned. The illustration shows the attachment fixed on the machine ready for operation.

It will be readily seen that the device consists of a tool-carrying block *A* sliding on a guide *B*, the guide having a shank to be fixed in one of the turret holes as shown. The toolblock is provided with a projecting arm, the length of which can be adjusted. At the end of the arm is mounted a roller which by means of a coil spring *C* is kept in contact with a former-plate having the same taper as the pins to be produced. The former-plate is fixed on the back toolblock on the cross-slide.



TAPER TURNING DEVICE FOR B & S SEMI-AUTOMATIC

The stock is fed in the usual way and passes through a steadyrest *D*, the opening of which can be adjusted to suit the diameter of stock used. The steadyrest is fixed on guide *B* by means of two screws.

The tool *E* is held in the toolblock *A* by means of two setscrews. It will be noticed that the tool is placed immediately behind the steadyrest, thus realizing the best working conditions.

A lever *F* is provided to take the tool away from the work to avoid spoiling the tool and marking the taper pin when bringing the turret back. For cutting off, a tool *G* is fixed on the front toolblock on the cross-slide.

Any taper can be obtained by changing the former-plate fixed on the back toolblock.

Safety Device for Paper Cutter

By C. D. Corwin
Works Engineer, Corona Typewriter Co.

Articles are frequently published illustrating or describing the means and methods used for making machines safer for the operator. Although it is a fact that many of the readers of these articles are not at the particular time of reading interested so far as the methods may apply to their own problems, it frequently happens that at some future date the suggestion or description does serve as a solution for a problem which has recently arisen. It is with such a thought in mind that the following material is written.

The paper cutter shown in the accompanying illustration is regularly provided with hand operating levers lettered *A*, one at each side of the table. These two levers are rigidly connected to a common shaft and the operation of either lever engages a clutch which drives the mechanism operating the knife.

The treadle *B* when depressed brings down a clamping piece just ahead of the knife in such a manner as to hold firmly the stock to be cut. It would seem, therefore, that this clamping device might serve as a warning device or safety guard in itself. In practice, however, in many instances the treadle and levers are operated in such close sequence (in many cases almost simultaneously), that the holding bar would serve to hold the operator's hand under the descending knife.

To render this machine safer it was decided to make the operation a two-handed one, that is, to make the use of both hands necessary before the cutting operation could take place.

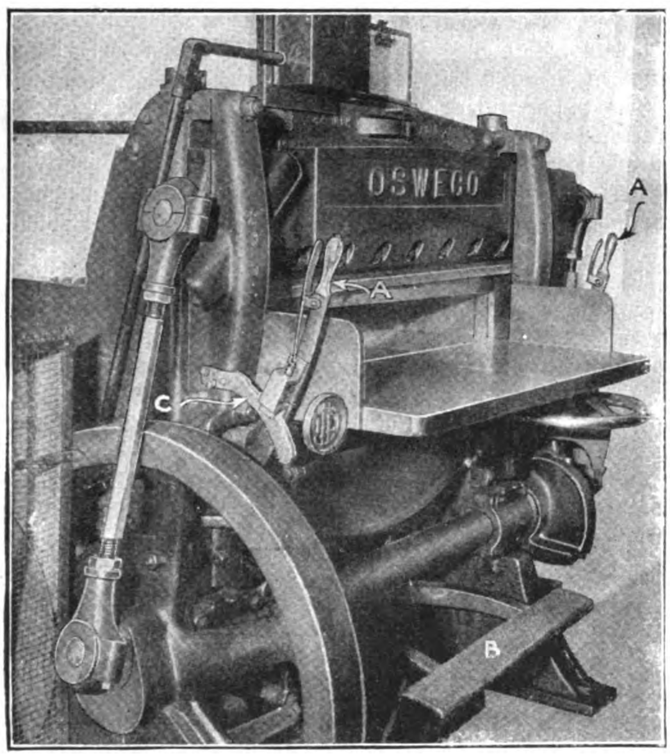
Two arcs lettered *C* in the accompanying illustration were formed of machine steel and bolted to the sides of the main frame in such a position as to hold the two latches, carried by the two regular operating levers. As these two levers were both rigidly connected to a common shaft it was necessary to open both latches before the machine would operate. It was at first

thought that this method of operating would hamper the operator in some cases. This fortunately has not been the case and a much greater sense of protection has resulted.

The Labor Inspectors of New York State of late have been giving considerable attention to print shop equipment. Such protection as just described, however, overcomes much of the objection to that class of machinery.

Although there naturally would be many designs which would render paper cutters safer, the device herein described is simple, is easily applied without changes in the mechanism of the machine and thoroughly accomplishes the purpose aimed at. This device has been in operation about a year and a half and no trouble or dissatisfaction has resulted.

With the utmost care accidents will happen and it is hoped that where paper cutters or machines of similar nature are used this article may be the means of saving a hand or finger.



PAPER CUTTER WITH SAFETY DEVICE

Peculiar Flaw in Bar Stock

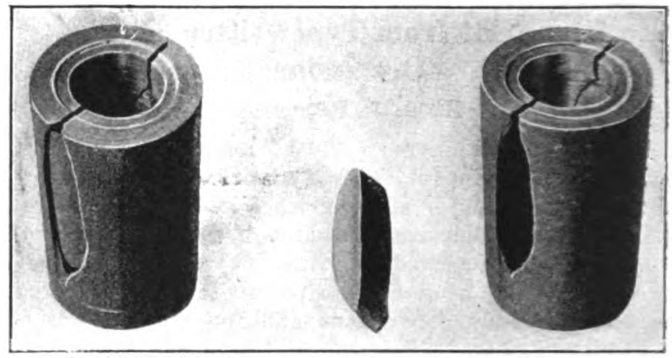
By Milton Wright

The accompanying cut shows a peculiar fault in the structure of a bar of point twenty-five carbon hot rolled steel. The bar in which it was found was one of a number of similar bars included in a shipment from the mill.

The fault is not a crack, but an oblong hole extending clear through the bar and was so completely filled by a plug, or "kernel," before the center hole was drilled as to escape casual inspection. When the bar was in the screw machine being transformed into machine parts, attention was called to the flaw by the continued breaking of drills.

The plug was, of course, cut in two by the drill. One part cannot now be removed from the bar, though it is sufficiently loose to be moved about with the fingers. The other part may be taken out toward the center hole but not from the outside of the bar.

There is considerable speculation as to how the flaw came about. One theory is that a larger bar had been drilled and plugged, and at a later time rolled to the present diameter, which is $2\frac{5}{8}$ inches.

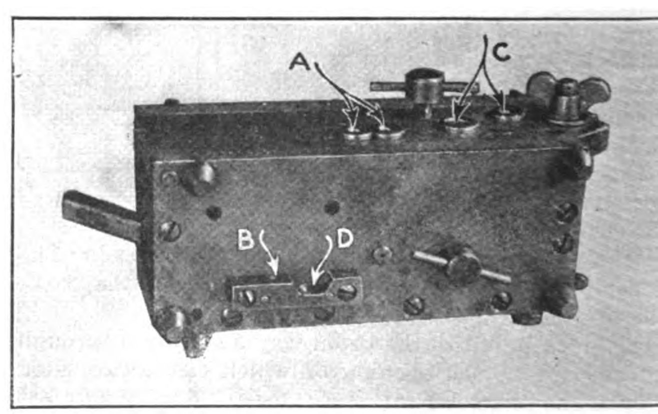

PECULIAR FLAW IN A BAR OF MACHINE STEEL

The photograph does not show two pieces, but two views of the same piece; one with the loose part removed and one with it in place.

Stop for Setting Drills

By H. E. Crawford

The job of drilling a blind hole is often an uncertain one and we had so many pieces spoiled, due to the fact that the operator either mis-read the scale on the spindle of the machine, or went to sleep and drilled the hole too deep, that we were forced to devise a foolproof method of setting the drills. The result was that we attached a lug to the side of the jig, as shown in the photograph, at exactly the right height, so that when the operator inserts a drill in the chuck for drilling the two holes indicated by the bushings *A*, he pulls the spindle down as far as it will go and rests the point of the drill in the countersink *B* and then tightens the chuck. When setting drills for drilling the two holes *C*, he rests the point of the drill in the countersink *D* and tightens the chuck. When drilling the piece, he feeds the spindle down as far as it will go, at which point the hole is of the correct depth. A small hole is drilled through the bottoms of the countersinks *B* and *D*, which prevents dirt collecting in the bottom of the depression. This saves both time and material.



JIG SHOWING LUG FOR SETTING DRILLS

Editorial

Idle Machines that Frequently Pay

TOO many managers seem to overlook the fact that the net cost of an article is what counts. They let side issues block their view of the real issues. One phase of this attitude is pointed out by John R. Godfrey in another column.

It is unfortunate, but true, that too many managers have certain notions, good in themselves but not the only factors to be considered. Keeping machines busy is one of these notions. An excellent idea in itself, it may easily lose money for the firm unless the net cost is carefully considered.

No one interested in economical management likes to see machines standing idle. But the man who criticizes the management of a shop that has idle machines is frequently guilty of that sort of snap judgment that proclaims him as being superficial instead of keenly observing. There are many cases where a machine that stands idle half the time is the best investment in the shop.

It is particularly important that this point be carefully thought out and understood at this time. There are new machines on the market with greater capacity than ever before, perhaps greater capacity than you can utilize at present. But before you decide against purchasing, figure out the net cost per piece, including idle time of course, very carefully. You are likely to find a net saving. If you do, there are many reasons for buying, and buying now.

The industry needs encouragement in every legitimate way. Any machine which will show a net saving on present production, should be bought now, if it can possibly be afforded. The man whose policy is to sit tight and buy only what is absolutely necessary is hindering the return of prosperity for himself as well as for everybody else.

Justice Works Both Ways

SPEAKING before the Plainfield Section of the American Society of Mechanical Engineers, A. L. DeLeeuw, whose name is familiar to readers of *American Machinist*, declared that the only basis on which satisfactory industrial relations can be based is justice. Mr. DeLeeuw went on to say that acts of injustice are quite as frequent on the part of the employees as on the part of the employers and in some trades far more frequent.

The shortcomings of the employers have been laid bare by the old muckrakers, the labor leaders and the modern sentimental investigators, and their duty has been pointed out with careful attention to detail. They have been admonished from the pulpit, villified by the demagogs and the radical press and investigated by governmental authority. If their way is not clear before them it is no fault of those whose welcome duty it is to tell the other fellow how to run his business.

The employee on the other hand has fared much better in his treatment by the uplifters. The principal effort in his case has been to enumerate and emphasize his rights with but the most casual attention to his duties. So one-sided have been the endeavors of his sympathetic friends and self-appointed representatives that he could be hardly be blamed if he completely lost sight of the fact that he has duties to perform as well as rights to claim.

The right to strike has been claimed so often and so vociferously by labor leaders that the right to work as defined by the Kansas Court of Industrial Relations and other judicial bodies has been somewhat neglected. The duty of rendering a fair day's work in return for a fair day's pay is one that should not be avoided, and cannot be in the long run if we are to continue our existence as a community.

Perhaps the insistence of the courts that this duty on the part of the employee is a very real one, is one of the reasons why Mr. Gompers recently expressed the devout hope, "God save labor from the courts!" If he and the other leaders of organized labor had been wise enough to spend a quarter of the effort in pointing out the duty of the workman to give a fair return for his wages, that they have spent in telling him about his rights, there would probably not be the need to fight for the threatened rights that undoubtedly exists in some quarters.

The average employee is just as anxious to play fair as the average employer. If each should subordinate everything else in an affort to deal justly, industrial peace would be in sight.

New Things That Are Old

THE replies to the query by I. B. Rich regarding the use of serrated axle ends for preventing the crank from turning, emphasize the salient facts. One, the difficulty of tying up events and dates in the average mind, and the other the time and money we spend in reinventing old devices.

Few men have memories which retain many details of events and we must apparently depend upon the printed page for authentic data as to the use of different devices. The difficulty is in knowing where to look for the information desired. The loss which this lack of knowledge entails can hardly be estimated, for thousands of hours and dollars are spent every year in working out some mechanical problem which has been used, perhaps many times, and lost sight of because the need for it temporarily disappeared.

Knowledge of what has been done before would also have a great effect on the granting of patents. Many devices and processes which have been used in the past have never been patented, so that the patent office has no record of their existence.

It has been suggested that the colleges could do a good work by collecting, filing and teaching, to some extent, the history of machine design and of machining processes. Such data would be of great value to all manufacturing establishments and they could well afford to pay for the information so obtained. It is not an easy task, but it is one well worth thinking over.

Shop Equipment News

Colburn Heavy-Duty Vertical Boring and Turning Mills

The Colburn Machine Tool Co., 1038 Ivanhoe Road, Cleveland, Ohio, is now placing on the market a line of heavy-duty vertical boring and turning mills that have been the subject of test and experiment for a number of years. The sizes include 42 in., 48 in., 54 in., 62 in., 72 in. and 84 in. The chief characteristics of these mills are rigidity and features that permit easy, rapid and safe operation. Among them are single lever control for feed and rapid traverse of head and ram; automatic gravity lubricating system; forced lubrication of angular and vertical spindle bearings; spring counter-weighting of rams and turret slide; close adjustment ratchets, carrying micrometer dials, mounted on the heads; friction disk clutches to raise and lower the cross-rail; single pulley drive; table guard; ball bearing equipment; narrow guide bearings on cross-rail. Front and rear views of the 42-in. machine are given in Figs. 1 and 2, which also serve to show the distribution of metal and the depth of cross-rail and housing-tie.

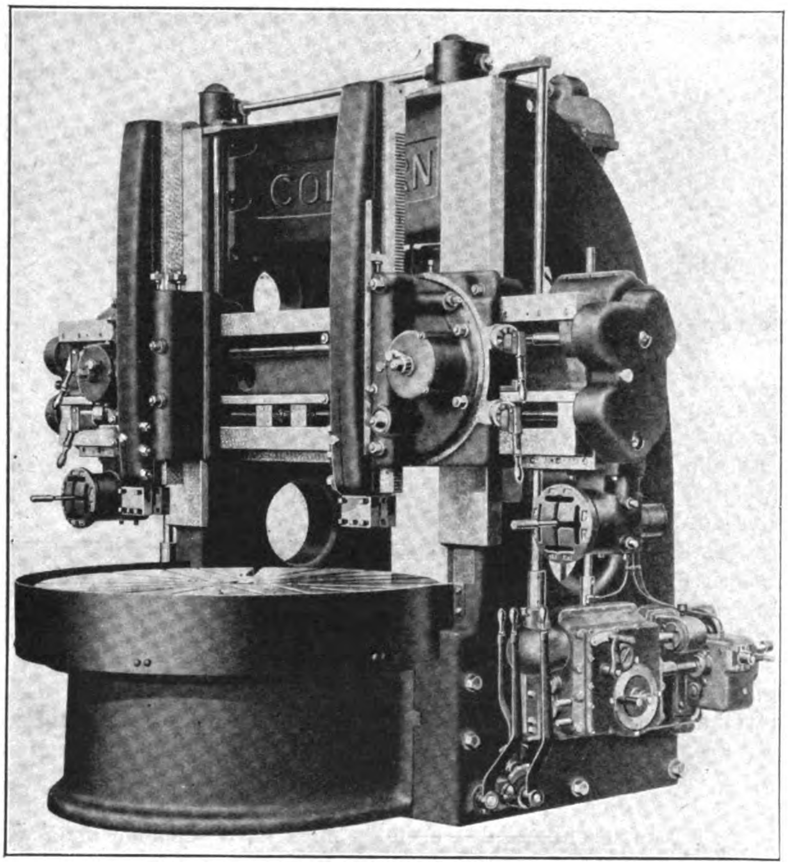


FIG. 1. COLBURN 42-IN. HEAVY-DUTY TWO SWIVEL HEAD BORING AND TURNING MILL

Specifications, 42-in. machine: Actual swing, 44 in.; diameter of table or chuck, 40 in.; height of table from floor, 33 in.; maximum distance under cross-rail, 36 in.; maximum distance under turret, 41 in.; swivel of heads either side of vertical, 45 deg.; table speeds, 12 changes, 2¼ to 70 r.p.m.; maximum ratio of gearing, 195:1; minimum ratio of gearing, 6⅓:1; horizontal and vertical feed, 16 changes, 0.006 to 1.000 r.p.m.; thread-cutting attachment, 2 to 24 threads per inch, including 11½; vertical travel of rams, 30 in.; vertical travel of turret slide, 26 in.; diameter toolholder shanks, ram 3 in.; turret, 2½ in.; maximum size tool accommodated, 1⅝ in. square; diameter turret, 13 in.; length of cross-rail, 97½ in.; width front face of cross-rail, 20 in.; vertical bearing of cross-rail on housing, 20½ in.; length horizontal bearings of saddles on cross-rail, 24 in.; width face of housing, 7 in.; driving pulley, 20 in. diameter for 5-in. double belt; speed of driving pulley, 440 r.p.m.; motor, 10 hp., 1,200 r.p.m.; net weight, 20,000 lb.; floor space and height, 108 in. wide, 97 in. front to back, 100 in. high; weight boxed for export, 23,000 lb.; boxed for export, 4 cases, 414 cubic feet.

The table is cast solid, that is, without being cored on the under side. Four sets of parallel T-slots are provided for holding faceplate jaws or fixtures. There are eight radial T-slots. The table spindle has a self-centering angular bearing and two vertical bearings. It is ground and is provided with spiral oil grooves cut on the vertical bearing surfaces. The table guard is of heavy sheet steel. There is clearance between table and guard so that chips may fall to the floor. Openings in the guard are provided for quick access to chuck screws on machines equipped with independent, built-in, four-jaw chucks. Twelve table speeds in geometrical progression are available. They are obtained by means of sliding gears and hardened positive clutches. Speeds are controlled by the operator from his regular working position, since both back gear lever and change gear lever are located on the front right-hand side of the machine. Gear shifts are accomplished by means of a cam arrangement, shown on the rear view of the assembled machine, Fig. 2. On each side of the machine, at the front, is a starting and stopping lever. Continuing the motion by which the clutch is disengaged, applies the brake.

Four of the twelve changes of speed are provided by the speed change gear box, or primary unit, and three by the secondary unit, located within the base of the machine. Power is transmitted through a single pulley with disk clutch. All gear shafts are mounted on ball bearings. Driving gears are held in position by keys and spacers.

Except where phosphor bronze gears are necessary, steel gears are used. Drive gears are stub tooth, heat-treated, except where size makes heat-treating impracticable.

The cross-rail is of the narrow guide bearing type. There are no projecting crank handles and clutches, which adds to the safety of the operator. Ball thrust bearings are provided at the ends of the crossfeed screws and vertical feed worm. Raising and lowering of the cross-rail is accomplished by engaging a multiple disk friction clutch running in oil, making unnecessary the use of tumbler gears, chains, sprockets, etc. The elevating device is shown in Fig. 3. The operation is by power, independent of the table drive.

The heads are independent in feed and traverse in

both directions. Each is provided with a feed box and a single lever control. Either head can be traversed to the center of the table for boring, where it is located by a positive hardened stop. Ratchets, mounted on the saddles, make possible close adjustments of the heads. Regular clamping bolts and additional long bolts are used to clamp the swivels to the saddles when the ram is in a vertical position. The added strength due to the long bolts is apparent.

Each ram has three taper gibs and an inset high-carbon steel rack running its entire length. The rams can be raised far enough that the bottom of the tool-holders will be above the lower edge of the cross-rail. They can be swiveled through 45 deg. either side of the vertical position. Swiveling is accomplished by means of a worm and segment, which makes setting easy and acts as a safety lock to prevent tipping when the clamping bolts are loosened.

Counterweighting of rams and turret slide is accomplished through spiral springs. This arrangement does away with weights, cables and sheaves. It prevents any interference with crane hook when brought directly over the center of the table. The spring can be adjusted to any desired tension, by means of a ratchet, as shown in Fig. 4.

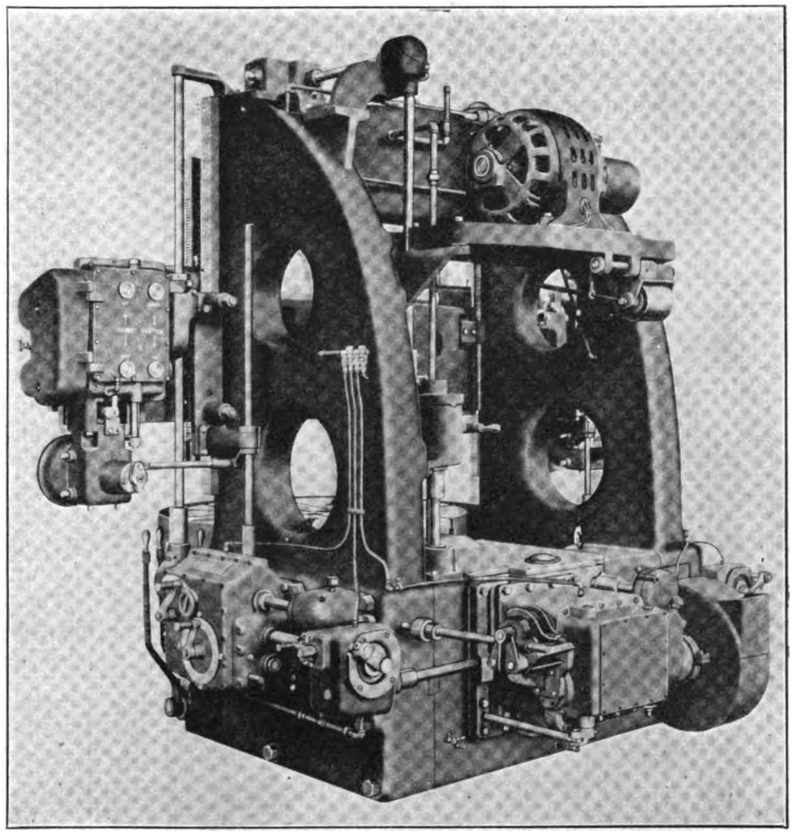


FIG. 2. REAR VIEW OF 42-IN. MACHINE

An especially noteworthy feature of the machine is the single lever control for head and ram of both feed and rapid traverse. The control for the right-hand ram is shown in Fig. 5. It is so designed that the lever is always thrown in the direction of the movement desired. When either feed or rapid traverse is engaged, the other is disengaged. Each of the four slots of the control plate is used for engagement of a feed and a rapid traverse. In each case the directions of feed and traverse are opposite. Running the slide to the limit of traverse without moving the lever to neutral position will cause the clutch to slip without damage to mechanism.

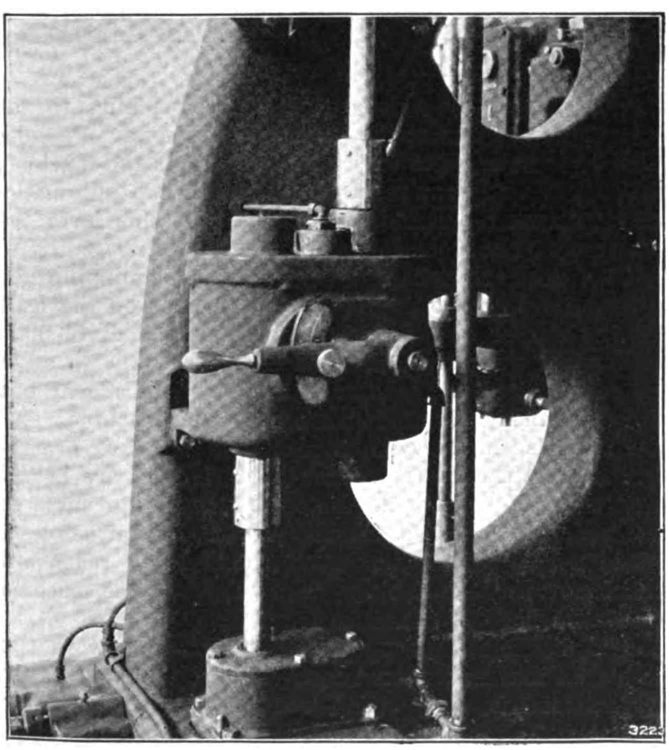


FIG. 3. CROSS-RAIL ELEVATING MECHANISM

Rapid traverse is obtained with the table in motion or at rest. The movement is at the rate of approximately 12 ft. per minute. Final adjusting ratchets for vertical and horizontal movements are mounted on the heads, a position making it unnecessary for the operator to leave his working position. They carry adjustable micrometer dials, reading in thousandths of an inch.

The secondary speed box forms an oil reservoir from which the oil is pumped to a cored chamber in the top brace. From there it flows to the feed cases, feed multiplying units, primary drive, spindle bearing and elevating device, passing through sight feed oilers on each side of the machine. The clutch boxes at the ends of the rail are filled with oil to a level indicated by an oil cup. Oil is pumped from the tank in the top brace to the outer edge of the angular spindle bearing and is fed by gravity down the vertical bearings back to the reservoir.

Power is applied through a single pulley mounted on ball bearings. A constant speed motor is mounted on a bracket between the housings at the rear of the machine and is belted to the driving pulley. An idler pulley maintains the proper belt tension. Radial and thrust ball bearings are used throughout the drive, in the clutch pulley and in the rapid traverse drive.

Threads of 4, 8 and 16 per inch can be cut without extra equipment. A thread-cutting attachment can be furnished to cut threads of from two to 24 per inch, including 11½. No changes in the feed mechanism are necessary.

A five-side turret head can be supplied. Each side

has three tapped holes for attaching box tools. The turret is tilted to an angle of 8 deg. to provide clearance for large tools when swung over the slide.

Sixteen changes of feed in geometrical progression from 0.006 to 1 in. per revolution of the table are available for both horizontal and vertical movements. Each

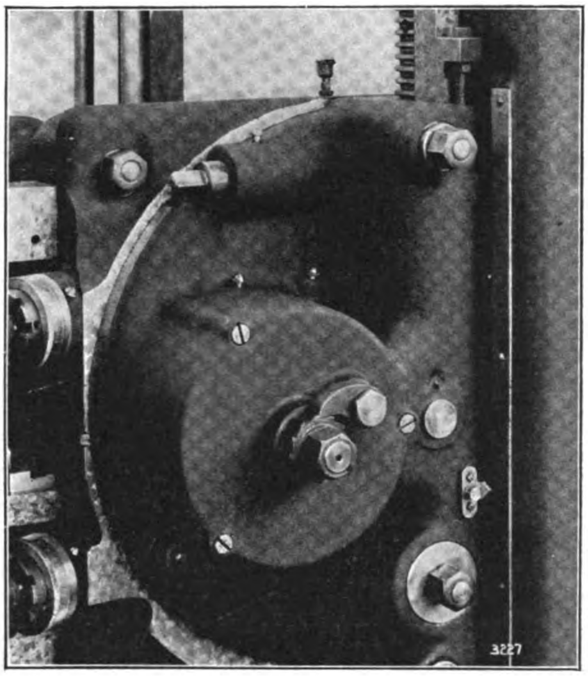


FIG. 4. SPRING COUNTERWEIGHT FOR COUNTERBALANCING RAM

head is independently controlled. All gears are steel.

The design includes among the safeguards for the operator: Encasement for all moving parts at the ends of the cross-rail; guards for driving pulley and clutch; table guard; friction feed clutches; an interlocking arrangement making it impossible to start the machine before the driving gears are fully in mesh, and preventing the making of speed changes until the clutch pulley has been disengaged.

The machine can be equipped with revolving center head for boring, reaming and facing operations on such

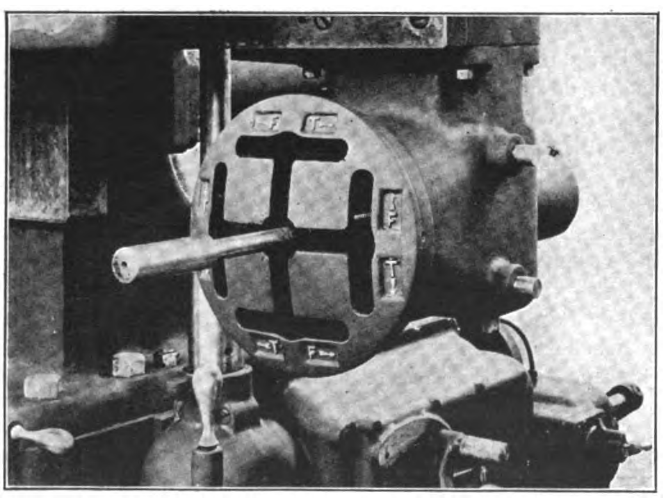


FIG. 5. SINGLE LEVER CONTROL FOR FEEDS AND TRAVERSE OF RAM

pieces as flywheels and pulleys; grinding spindles; milling spindles; cutting lubricant outfits; cross taper and forming attachment, and pulley crowning attachment.

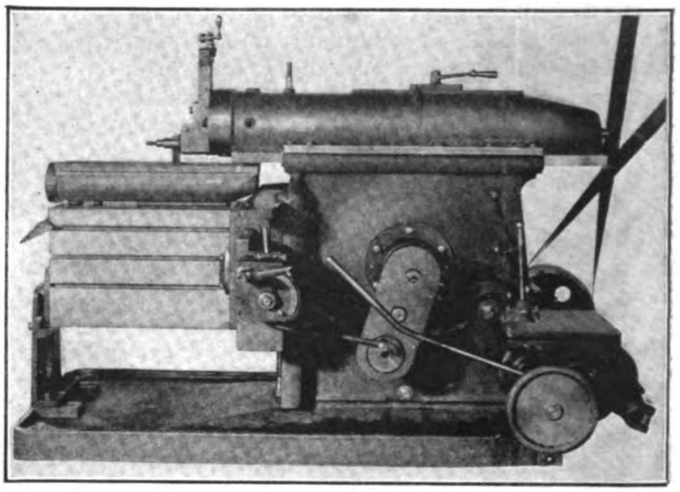
Kelly 32-inch Shaper

The 32-in. crank shaper shown in the accompanying illustration is a recent development of the R. A. Kelly Co. of Xenia, Ohio. The view shows the machine at work on the ram of a 14-in. shaper and gives an idea of the difference in size between the 14- and 32-in. machines. The 32-in. shaper is intended particularly for heavy duty, such as in railroad and forge shops.

The extreme stroke is 33 in., with a vertical movement of the table of 12½ in. and a cross traverse of 30 in. The table is of the revolving type, and work may be clamped on either side or the top. A special feature is the table support.

The feed mechanism on the machine is very simple and all parts are enclosed in a box. To change feeds, it is not necessary to touch any moving part. The feed cannot be caused to operate during the cutting stroke of the ram. The direction of the feed is controlled by a straight knurled lever on top of the box, and the amount of the feed by the lever on the side.

The gear box is patterned after an automobile gear box, and has four changes of speed, which are engaged by a ball lever on top of the box. The clutch and brake



KELLY 32-INCH SHAPER

are controlled by a long steel lever reaching to the operator's position at the front of the shaper. Pushing this lever in engages the clutch and starts the machine, while pulling it out releases the clutch and automatically engages the brake. By the use of this lever the ram may be brought to a stop at any point.

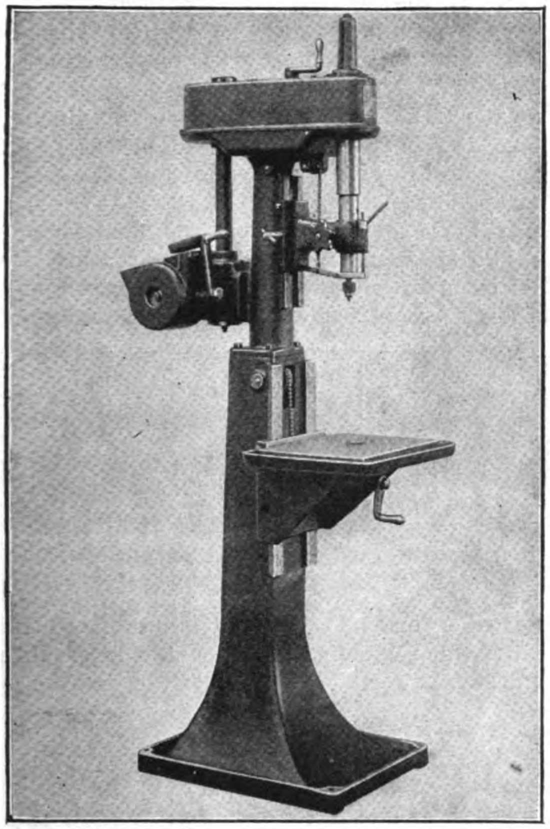
The only changes to be made when equipping for motor drive are bolting a bracket to pads on the back of the shaper and putting a gear on the drive-shaft instead of the pulley. All machines are built so as to be easily fitted with motor equipment, and a gear box may be quickly installed on a cone-driven machine.

All holes in the column and gear box are bronze-bushed and the shafts hardened. All gears are helical and made of steel or semi-steel. The sliding surfaces are provided with felt wipers, and lubrication has been made nearly automatic. Places difficult to reach are lubricated through tubing. The weight of the machine as shown is 6,500 pounds.

The machines are built for close, exacting work. It is stated that in a recent test, the machine very easily took a cut 1 in. deep with ⅛-in. feed in cast iron. After this test, the table was brought to its lowest and then to its highest position, and tests aken with a dial indicator showed that no corner was out 0.001 in.

Fosdick 13-inch "Superspeed" Drilling Machine

The sensitive drilling machine illustrated herewith has recently been added to the line of the Fosdick Machine Tool Co., Cincinnati, Ohio. It is built in a



FOSDICK "SUPERSPEED" DRILLING MACHINE

13-in. size, in two types, bench and pedestal, and in combinations of from one to eight spindles. The capacity is for drills up to ¼ in. in diameter in steel, iron or brass.

With the driving pulleys running at 1,750 r.p.m., three spindle speeds of 5,700, 8,000, and 12,000 r.p.m. are available, although other speeds to suit conditions may be substituted. All revolving members are equipped with annular ball bearings and dust-proof metal oil retainers, and the only revolving member exposed is the drill chuck. The helical-gear drive reduces vibration and noise. Because of the gears and the flat endless belt, the danger of drill breakage at maximum speeds is said to be greatly reduced.

The outstanding feature of the machine is the speed-changing arrangement, by which a single turn of a handle automatically releases the belt tension, shifts the belt first from the larger to the next smaller step on one cone pulley, and then by a similar movement from the smaller to the next larger step on the other cone. The belt tension then automatically adjusts to the new position. An aluminum guard, which completely encloses the belt and cone pulleys, may be lifted off without removing or loosening bolts or nuts, thus enabling the operator to install a new belt very easily.

In the pedestal-type machine illustrated herewith a very large floor area is provided. The elevating table is of the quick-acting counter-balanced type, with the clamping handle in front. The traverse is 10 in. Both the elevating and the bench tables are surrounded by liberal chip and lubricant channels.

The head has a vertical traverse of 6 in. and is counterbalanced to prevent dropping when unclamped. The spindle feeds to a depth of 3 in. and has an adjustable depth stop. It has an adjustable gravity counterbalance which employs no springs and which may be set to automatically return the spindle. The feed lever is adjustable to suit the operator. Opposite the feed lever is the quick-return handwheel, which enables the operator to position, feed, or return the drill with either hand.

The belt guard and shifter can be adjusted to receive the belt from any angle. Motor drives are either belted or direct connected, with a ½-hp. motor mounted on the machine. The regular equipment includes a No. 1A Jacobs drill chuck on each spindle. The bench-type single-spindle machine weighs 225 lb., and the pedestal type 464 pounds.

Brown Direct-Reading Resistance Thermometer

A direct-reading resistance thermometer, shown in Fig. 1, has recently been placed on the market by the Brown Instrument Co. of Philadelphia, Pa. The thermometer is intended for industrial use, and particularly for installations where it is necessary to know accurately a high temperature when only a small range is required. The large size of the divisions for each degree permits of more accurate reading than when the range on the scale is from zero.

The principle on which the operation of the thermometer is based is the change in electrical resistance occurring in metals with a change in temperature. This change can be accurately measured, and a scale calibrated to read directly in degrees of temperature. The coil of wire which changes in resistance is usually of nickel for temperatures up to 300 deg. F., and of platinum for temperatures up to 1,800 deg. This coil or "bulb" can be very small; a nickel wire bulb can be supplied with an active part 1 in. long and 3/16 in.

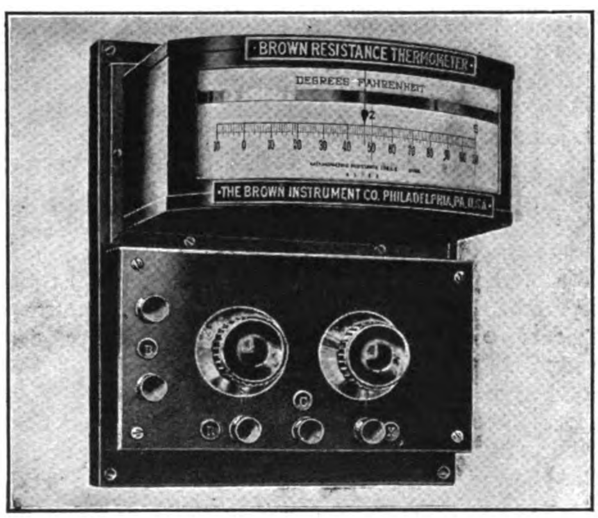


FIG. 1. BROWN DIRECT-READING RESISTANCE THERMOMETER

in diameter, and the protecting tube need have an outside diameter of only ¼ inch.

Bulbs can be furnished for all types of uses, whether for high or low temperatures or for use in chemical

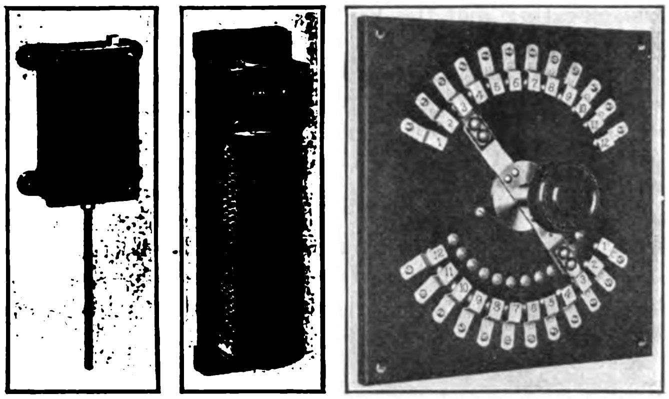


FIG. 2. BROWN BULBS AND SWITCH

processes. The view at the left of Fig. 2 shows a bulb for use in damp locations, while the view in the center shows the style ordinarily employed in rooms where no special conditions exist to disturb the operation. The latter type of bulb can be employed for public buildings, where accurate registration of the temperature is required.

The switch shown at the right of Fig. 2 enables connecting the instrument to any number of these resistance thermometer bulbs. For use in dry kilns, the instrument can be employed to measure both temperature and humidity, one bulb being subjected to the air temperature only, and the second bulb being covered by a wick connected to a tank of water.

Three wires lead from each bulb to the instrument, and changes in temperature along the wiring do not affect the reading. The length of the wire is immaterial, and the bulbs can be placed up to 1,000 ft. distant from the instrument when using 14-gage copper wire, or up to 2,500 ft. with 10-gage copper wire.

In checking the instrument for the zero reading in order to determine its accuracy, it is not necessary that the pointer be brought down to zero, since most scales are not provided with such a reading. However, the left-hand knob is turned to *Z* and then to *S*, to check the instrument with a standard resistance. When the knob is placed in the third position, the instrument is operated directly from the temperature bulb. The rheostat controlled by the right-hand knob on the instrument is used for adjusting the voltage. This check of the instrument is stated to be necessary only occasionally.

Modern "Quickgrip" Drilling Machine Table Vise

The Modern Machine Tool Co., 401 Water St., Jackson, Mich., has recently taken over the manufacture and sale of the "Quickgrip" table vise from the Sprague-Hayes Manufacturing Co. of Detroit, Mich. The vise, which was described on page 490, Vol. 51, of *American Machinist*, is intended for use on upright drilling machines.

The device is secured permanently to the machine and serves as both a table and a vise. When the vise is closed, the work-carrying table is 16 in. in diameter. A maximum jaw opening of 8 in. is provided, one jaw being moved by a $1\frac{1}{4}$-in. screw. The use of the device saves the time taken in mounting and removing a vise from a plain table. Either a plain, flat table or a vise or both together are quickly available.

Bath Ground Tap with "Sharpening Face" Flutes

A line of carbon and high-speed steel ground taps such as shown in Fig. 1 is being introduced by John Bath & Co., Worcester, Mass., incorporating a feature designated as the "sharpening face" flute.

As may be seen in the drawing, Fig. 2, which shows a section of the tap in contact with the grinding wheels, the shape of the flute is such as to leave a projecting face upon which is the cutting edge. The actual cutting face of each tooth is undercut by the round-face grinding wheel to give the effect of top rake and insure a clean and free-cutting tooth.

The taps are ground to size and final shape after hardening, thus removing all decarbonized material and eliminating errors due to distortion in hardening. The thread is not eccentrically relieved in the ordinary way,

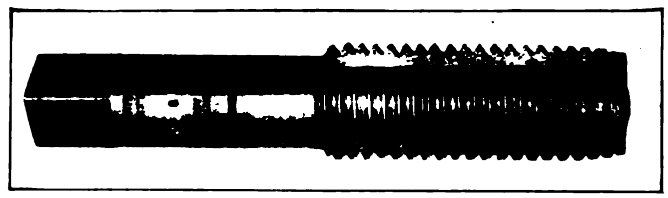


FIG. 1. BATH GROUND TAP WITH "SHARPENING FACE" FLUTES

but is given a form of relief that is peculiar to this tap alone and which is claimed to result in longer life.

The first four teeth, which remove by far the largest

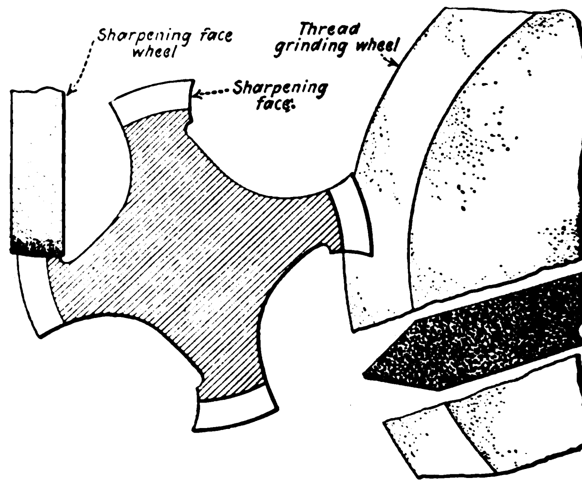


FIG. 2. SECTION OF TAP IN CONTACT WITH GRINDING WHEELS

portion of the metal from a threaded hole, are eccentrically ground, but the remainder of the cutting part is concentric and the outside diameter uniform. Beginning with the fifth tooth and continuing for four or five turns, the pitch diameter is constant and to exact nominal size. From this point, however, the pitch diameter falls away in a uniform taper toward the shank, where at the last turn of thread it is 0.00125 in. under size.

The advantages claimed for this tap are that the gradually lessening diameter reduces the tendency to bind and makes a free cutting tool; and that, because of the concentricity of the thread, regrinding the cutting face may be carried to any extent without diminishing the diameter of the tap or otherwise impairing its accuracy. The life of the tool is thus greatly prolonged.

Horton Differential Chuck

The E. Horton & Son Co., Windsor Locks, Conn., has developed a chuck for turret and engine lathes in which the power of the machine is utilized to close the jaws and grip the work, doing away with the necessity for wrenches and lessening the time and labor of setting up as compared with that required with a manually operated chuck. The chuck is of the scroll type and may be fitted with any of the standard Horton chuck jaws for internal or external holding.

The scroll-plate is considerably thicker than in the regular scroll chuck, and instead of the usual teeth of a bevel gear upon its periphery, as in wrench-operated chucks, the back face is counterbored and in the recess thus formed an internal gear is cut from the solid metal. The absence of teeth upon its periphery allows the scroll-plate to take its bearing within the body of the chuck upon its outer circumference, instead of upon the narrower and smaller diameter of its bore.

Directly back of the scroll-plate in the assembled chuck is an annular steel ring, attached to the body of the chuck as described later. Upon the inner circumference of the ring are cut the teeth of an internal gear similar to the one in the scroll-plate but slightly larger in pitch diameter. This ring is called the "backing gear."

Turning freely upon a large ball bearing mounted on the hub of the chuck is a ring, known as the "handwheel," of the same outer diameter as the chuck body. This wheel may be seen in Fig. 1, where it appears as the knurled portion of the body, and separately in Fig. 2 with the backing gear and differential pinions in their respective places.

Five pairs of pinions are mounted on studs shouldered into the inner face of the web of the handwheel. Of each pair, one pinion is slightly smaller in pitch diameter than its mate and meshes with the internal gear of the scroll-plate, while the larger one meshes with the backing gear. The two pinions of each pair are pinned together as one piece, the entire mechanism thus forming in effect an epicyclic train.

Considering for the moment that in the assembled chuck the backing gear is rigidly attached to the chuck body, it is obvious that if the handwheel (carrying with it the pinions) is rotated in a forward direction upon the stationary chuck, the pinions will run freely around in mesh with their respective internal gears. However, because of the differential ratio, the internal gear that is part of the scroll-plate will turn slowly backward with relation to the stationary chuck body.

Similarly, when the chuck is running forward with the lathe, if the hand is pressed upon the knurled part of the handwheel and its rotative movement stopped, the differential action of the epicyclic train will cause the scroll-plate to creep slowly ahead of the revolving chuck and thus close the jaws.

This differential action may be made in any desired ratio. In practice, it has been found desirable to make it about 9 to 1, causing the chuck jaws to move radially $\frac{1}{32}$ in. for each full revolution of the handwheel upon the chuck body. When mounted upon a machine, as a lathe, turret, or screw machine, a lever and brake are supplied to be attached to the headstock, thus providing means by which the pressure may be applied to hold the handwheel stationary while the rotation of the chuck automatically closes the jaws upon the work.

Theoretically the backing gear should be firmly attached to the chuck body. Actually it is held to the latter by studs entering short curved slots upon its periphery in such manner as to permit a certain amount of lost motion or "backlash" in the mechanism. Thus a quick forward movement of the handwheel will deliver a hammer blow upon the train, and will effectively release the most obstinate grip. This rocking movement of the handwheel may be repeated, if necessary, until the chuck releases, when the wheel will spin rapidly forward without material resistance.

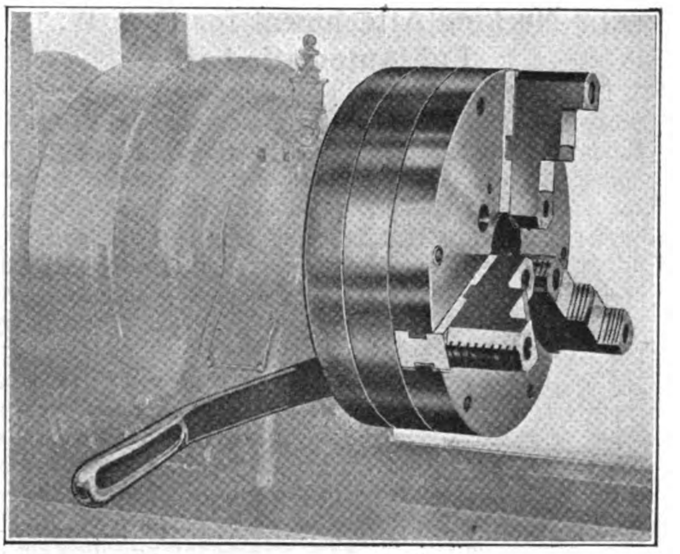


FIG. 1. THE HORTON DIFFERENTIAL CHUCK

Except for the manner of operating it, the chuck is the same as the standard steel-bodied Horton chucks, the jaws being interchangeable. Though it has the appearance of greater width, the new chuck has no more overhang than the standard chuck; all of the additional mechanism is back of the faceplate.

As the power to move the scroll-plate is delivered at five equally spaced points around the circle of the plate, the pressure is balanced, and all energy applied to the handwheel is utilized to move the jaws. As all moving parts except the scroll-plate are mounted upon ball bearings, the handwheel turns easily and may be spun rapidly backward or forward to open or close the jaws any considerable distance.

The chuck holds any piece within the range of standard chucks of similar sizes without adjustment or change of parts. All parts remain stationary with relation to the chuck body except when operating the jaws; therefore, there are no frictional losses or wearing of parts when the chuck is running. The chuck is available in the 13-in. size, and will be made in 9-in. and $16\frac{1}{2}$-in. sizes.

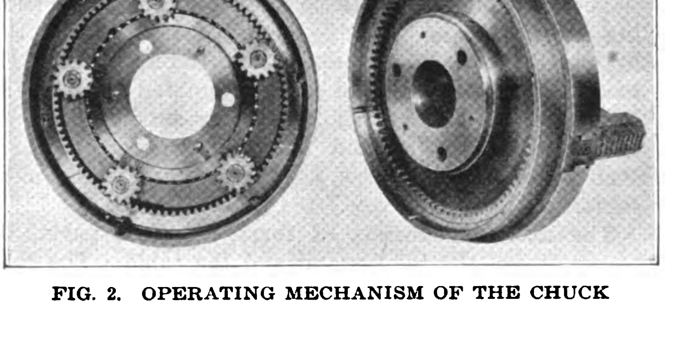
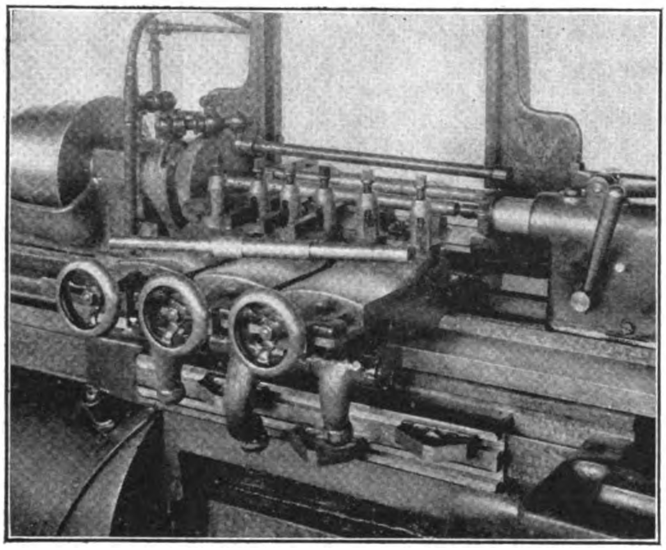


FIG. 2. OPERATING MECHANISM OF THE CHUCK

Necking Attachment for P. & W. Full Automatic Lathe

The Pratt & Whitney Co., Hartford, Conn., has recently brought out a necking attachment for use on its full automatic lathe such as described on p. 897, Vol. 55, of *American Machinist*. The attachment is used for squaring shoulders or necking below the turned surfaces of work that is being prepared for grinding, although it is adaptable to other operations where the crossfeed can be utilized. It can be readily removed and the regular carriage with its actuating parts applied to the lathe.

The attachment consists of multiple carriages that replace the regular carriage of the lathe. One, two or three of these carriages may be adjustably clamped to the front way of the bed. They carry regular toolslides, and provision is made for employing multiple toolposts. Adjustment for depth of cut is made by the handwheels shown in the accompanying illustration



NECKING ATTACHMENT ON P. & W. LATHE

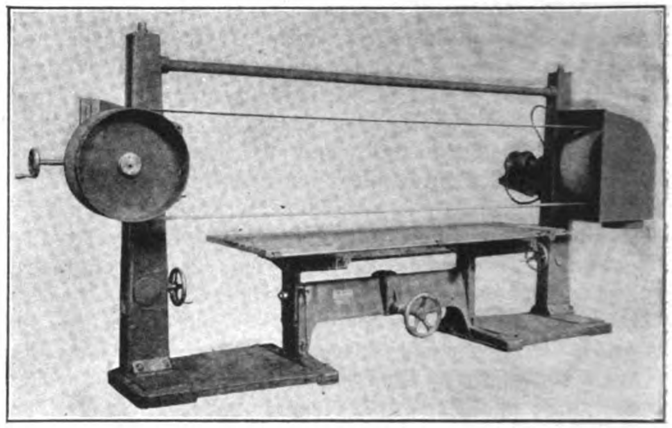
mounted on screws with graduated dials reading in thousandths of an inch.

The cross-slides are actuated, through the medium of roll-carrying arms, by the adjustable cams mounted on a cam carrier that is reciprocated longitudinally by the main feed cam of the machine. These cams can be adjusted to provide any sequence of the cross movements, or all slides may be moved in unison, depending on the nature of the work. Suitable oil distribution is provided, and all of the automatic functions of the lathe are retained.

Oliver No. 183 Self-Contained Belt Sanding Machine

The belt sanding machine shown in the accompanying illustration has recently been placed on the market by the Oliver Machinery Co., Grand Rapids, Mich. The machine is self-contained and designated as No. 183. It is adapted particularly to rapidly sanding and polishing straight, flat and irregular wooden surfaces, such as on large patterns, as well as to polishing metal surfaces.

The machine consists of three principal parts, the power stand, the idler stand and the table. The table is fastened to the base plates of the stands, which are connected overhead by a rigid bar. The sand belt pulleys run on ball bearings that are provided with individual adjustment vertically. The bearing housings



OLIVER NO. 183 BELT SANDING MACHINE

are mounted on gibbed, graduated ways and are moved by means of handwheels operating through bevel gears and screws.

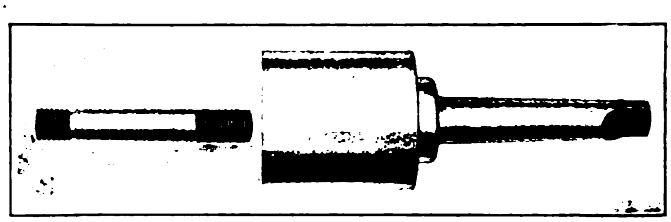
The arrangement of the parts of the machine is convenient for the operator, so as to enable quick work. The spokes in one pulley are guarded and the other pulley is entirely enclosed in the exhaust hood. The table rolls on ball bearings, and not on ball-bearing rollers. No gravity idlers are employed. The table is 96 in. long and 32 in. wide. It travels 36 in. horizontally and adjusts 14 in. vertically. The belt is about 31 ft. long and any width up to 10 in. may be used.

With the slow-speed motor drive, the motor is directly connected to the driving pulley. A high-speed motor may be geared to the pulley, as shown in the illustration. The pulleys are 24 in. in diameter and have 10-in. faces. They are rubber faced and run at 600 r.p.m. The large diameter of the pulleys requires that the belt be bent but little when passing around them, so that the life of the belt is increased. By means of a reversible switch, the belt may be caused to run in either direction.

The machine will take work of any length, and sand to the center of a 72-in. circle. It will hold work 42 in. high on the table, and by unbolting the table, work 66 in. high from the floor can be accommodated.

Jarvis Self-Opening Stud Setter

The Geometric Tool Co., New Haven, Conn., has recently placed on the market the Jarvis self-opening stud setter shown in the accompanying illustration. The tool is simple in design and provides a quick grip and



JARVIS SELF-OPENING STUD SETTER

release for the work. The parts are hardened and the tool is made to withstand long service.

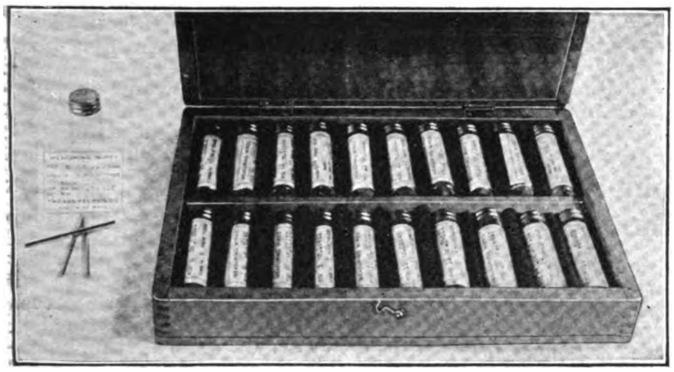
The setter is made in three sizes. The No. 1½ size

has a capacity up to ½-in. studs, and is provided with a No. 2 or 3 Morse taper shank. The No. 2 size has a capacity up to ⅞ in., and Nos. 3 or 4 taper shanks. The capacity of the No. 3 size is up to 1¼ in., and Nos. 4 or 5 shanks are used. Special sizes of taper shanks can be furnished to suit particular needs, and special sizes of jaws can be supplied.

Van Keuren Thread-Measuring Wires

The Van Keuren Co., 362 Cambridge St., Boston, Mass., has recently added to its line various sizes and sets of wires for use in the measurement of screw threads, angles and profile gages. The measuring wires are made by methods similar to those used in the manufacture of gage blocks, so that wires which are practically perfect as to roundness, uniformity of diameter and size are said to be produced. The wires are standardized by light waves against standards certified by the National Bureau of Standards at Washington, D. C., so that their accuracy is assured.

The wires are 1⅞ in. in length and are lapped the full length, thus giving a long wearing surface. They are usually furnished without handles or suspension ends,



VAN KEUREN THREAD-MEASURING WIRES

which can be supplied when desired. The wires provided for screw-thread measurement are known as "best size" wires; that is, wires of the theoretical diameter to touch on the pitch line or at the pitch diameter of a perfect thread. By using the "best size" wire for each pitch, the measurement of pitch diameter secured is unaffected by any error of angle which may be present in the thread measured. The angle of thread may be easily checked by taking a measurement with the next larger size of wire.

The glass bottles in which the wires are packed give protection against rust and loss or breakage of wires. The label on each bottle shows the calibrated diameter of the wire to hundred-thousandths of an inch. On the label is also given the formula for the measurement of pitch diameter of the screw thread. When using the "best size" wire to find the pitch diameter, all that is necessary is to subtract a constant given for the three wires from the micrometer measurement taken over the wires as they lay in the screw thread.

The set shown in the accompanying illustration includes the common sizes of wires from 6 to 36 pitch, and contains all of the wires needed for the measurement of U. S. Standard, S. A. E., National Coarse and National Fine threads between these pitches. Additional sizes are made ranging from a ½-in. diameter measuring plug to wires for measuring 90-pitch threads, which are 0.00641 in. in diameter.

When It Pays to Have Machines Idle

By John R. Godfrey

Man is a funny bird. And an X-ray of the stuff which passes for brains would in many cases be a good imitation of a vacuum. The particular kind of a bird I have in mind is the alleged manager who won't buy a machine unless he can keep it busy all the time.

Such a bird was giving a new grinding machine the once over not so long ago. It was a whale of a machine and the way it chewed off metal was a marvel to all beholders. That was why the aforesaid manager didn't order one. It did the work too quickly. He couldn't keep it busy all the time and an idle machine is his pet aversion. "Eats its head off" was his favorite bromide when giving his reason for not buying.

The Point of View

It's the old story of not looking at the whole subject—of seeing just one particular angle and forgetting the real factor, net cost. It's the same type of managerial mind which refuses to pay a good man a dollar an hour and pays two dubs sixty cents each to do the same work.

The ideal condition is to have every machine working at its maximum. But the man who tries to limit his equipment to his exact requirements, soon strikes a snag. Machines will break down and wear out occasionally. Tools will break and men still get sick or bury their mothers-in-law occasionally. And so every good manager allows a surplus machine equipment to take care of this. Otherwise he finds production schedules completely busted and delivery dates a thing of the past.

We all like to see every machine busy. But if we can save money by running a machine only one week a year, that's the thing to do. It's all a question of balancing one expense against another—and that is really the essence of successful business.

This doesn't mean that you should buy every machine that comes out, even if it can do some of your work faster than those you have now. What you want to do is to figure the first cost, interest on investment, overhead charges by the year and see how much your prodduct costs per piece with these charges against it. Of course you count labor, but only while it is operating the machine, for labor is at work elsewhere even when the machine is covered with grease and glory.

Surplus Machine Capacity

It frequently happens that a machine that can clean up all the work necessary in one week out of four, is a paying investment. Even if careful calculations show that the new machine will not more than break even, and it has surplus capacity, it is usually a good buy. For this surplus capacity is an incentive to find other work for the machine, and it frequently happens that work which was not at first considered, finds its way to the machine and is done more economically than before. Surplus machine capacity is usually much better than surplus floor space. You always have the possibility of increased production without further expenditure and at a reduced overhead.

So, before you join the ranks of the one-idea managers, who think a machine that is not working all the time is a poor investment, just figure it out from all sides. The chances are you'll be money ahead at the end of the year if you buy it.

News Section

March Exports of Steel Total 210,095 Tons

Exports of iron and steel from the United States in March totaled 210,095 long tons, an increase over January and February of this year of 40 and 55 per cent respectively. These figures are taken from statistics compiled by the iron and steel division of the Department of Commerce. Noticeable increase was made in the exportation of flat steel sheets, steel rails and plates, boiler tubes and welded pipes, structural steel, iron and steel bars, plain wire, ingots and wire rods. Shipment of wire nails, tin plate, fabricated structural steel, iron and steel castings, horseshoes and ferro-manganese fell off somewhat during this month. The total volume of American exports of iron and steel for the first quarter of the year (508,070 tons) is at the rate of slightly more than 2,000,000 tons for the year. In 1921 the total, which comprised only those commodities listed according to quantity in the export transportation obtaining at that time, was 2,171,282 tons. For the year 1920 the volume of export was 4,702,632. There is evidence that the total volume for 1922 will exceed 1920.

Course in Employee Training at Wisconsin

A course in "Employee and Foremanship Training" has been established in the department of industrial education and applied arts of the University of Wisconsin, Madison, Wis. The purpose of the course is to give to students of engineering a conception of the problems of education and training found in industry, and the opportunities for trained men and women in various industrial positions. A careful study is made of the programs of large factories and corporations, and of the various foremanship courses given by other schools and agencies.

Federal Approval of Philadelphia Exposition

Full approval of Federal participation in the Philadelphia sesquicentennial celebration has been voted by the committee on industrial arts and expositions, which has reported, with certain amendments, the Darrow bill and recommends that it receive the prompt approval of the House.

The bill as amended specifies that Fairmount Park shall be the site of the exposition and that the form of Federal participation is to be determined by the President.

The committee believes that the sesquicentennial will be even more potent in its influence on industry than was the exposition in 1876 and in its official report to the House predicted that the exposition in 1926 will be the greatest international affair of the kind ever held.

Motor Car and Truck Production Increases

Reports received by the Department of Commerce show a further increase in the production of automobiles during April. New records were made for the output of both passenger cars and trucks, compared with the preceding ten months for which figures are available.

With the reports lacking for only a few small companies, the total April production of passenger cars amounted to 196,512, or an increase of nearly 30 per cent over the March production of the identical firms. The April truck production totaled 21,944 machines, compared with 19,449 from the same firms in March.

The following figures give the production for identical firms for the past four months.

1922	Passenger Cars	Trucks
January	81,638	9,204
February	109,039	12,968
March	152,647	19,449
April	196,512	21,944

Standards Committee to Conduct Survey

At the request of Secretary of Commerce Hoover, the American Engineering Standards Committee will undertake a canvass to determine what simplification in manufactured products is most needed and most desirable. This canvass will be conducted through the engineering and technical bodies having representatives on the committee, or co-operating in its work, and the survey will extend into almost every line of activity in America.

This assignment to the American Engineering Standards Committee is one of Secretary Hoover's steps to save for American industry a few of the many millions of dollars wasted annually, as has been revealed in the report on waste in industry which was made not long ago by a committee of the Federated American Engineering Societies. This request of Secretary Hoover and its acceptance by the committee is significant of the close co-operation between the Department of Commerce and American engineering and industrial bodies. There seems to be a general recognition of the fact that simplification of products and the improvement of processes are to a large degree only other words for standardization. This joint movement for standardization and simplification now under way may therefore be said to have begun its work in its own household, by standardizing, simplifying and unifying its own machinery and processes.

Representatives of this committee recently held a conference on this subject with Mr. Hoover, in Washington, and arrangements were made for an exchange of representatives between the two organizations so that there may be the closest possible co-operation between them.

Freight Loadings and Repairs

Loading of revenue freight totaled 755,749 cars during the week ending May 6, compared with 758,286 cars the previous week, or a reduction of 2,537 cars, according to reports just filed by the carriers of the United States with the car service division of the American Railway Association. This was, however, an increase of 34,027 cars over the corresponding week last year.

Compared by districts, increases in the total loading of all commodities over the preceding week were reported in only the Eastern and Central western districts, while all reported increases over the corresponding week last year except the Alleghany and Southwestern districts.

Freight cars idle on American railroads, because of business conditions, totaled 521,746 on May 8, compared with 529,658 on April 30, or a decrease of 7,912.

Of the total, 353,239 were surplus freight cars, while the remaining 168,507 were freight cars in need of repairs in excess of the normal number unfit for service.

Of the 2,274,240 freight cars on line, reports showed 327,704 or 14.4 per cent to be in need of repairs on May 1, compared with 317,783 or 13.9 per cent on April 15. Allowing 7 per cent of the cars on line as representing the normal number in need of repairs would leave 168,507 cars as the number idle because of business conditions and need of repair.

Revenue Bureau Gives Ratios for Amortization

The Internal Revenue Bureau has announced ratios of estimated post-war cost of replacement, for use by taxpayers in computing claims for tentative allowance for amortization. The ratios are expressed in percentages based on prices as of June 30, 1916, and include the following:

Electrical machinery and equipment, 130 per cent; engines, turbines, compressors and similar facilities, 175 per cent; pumps, 135 per cent; boilers, 160 per cent;

Transmission equipment including shafting, pulleys, hangars, etc., 135 per cent; belting, 100 per cent.

Machine tools and small tools (machine tools considered as that class of metal working machinery which can be used on both cast iron and steel), 130 per cent.

Wood working machinery, 155 per cent.

Textile machinery, 155 per cent.

All other machinery, including cranes, the cost of which did not exceed 10 cents per pound as of June 30, 1916, 120 per cent; machinery the cost of which did exceed 10 cents per pound as of June 30, 1916, 130 per cent.

Further information on amortization requirements appear on page 836d.

Steel Treaters Meeting in Pittsburgh

A sectional meeting of the American Society for Steel Treating, taking in the chapters of the society from Cleveland, Buffalo, Rochester, Syracuse and Pittsburgh, was held in the auditorium of the Bureau of Mines in Pittsburgh May 25, 26 and 27. The out-of-town chapters were the guests of the Pittsburgh section and were welcomed at the opening session by N. D. Hoffman, chairman of the Pittsburgh Chapter.

At the first session the following papers were presented: "Fiber in Steel and Iron," by Prof. F. F. McIntosh of the Carnegie Institute of Technology; "Mass Influence on Heat Treating," by W. B. Crowe, metallurgist, Carnegie Steel Co.; and "Impact Tests," by J. N. Lessels, Westinghouse Electric and Manufacturing Co. At the close of this session the members adjourned to the University Club where they were the guests at an informal dinner.

The morning of the second day was spent in visiting steel mills and manufacturing plants in and around Pittsburgh, ending with a luncheon at the Westinghouse plant. In the afternoon, under the chairmanship of H. M. Boylston, of the Case School, papers were presented on: "Abrasive Qualities of Carbon and Alloy Steel," by A. M. Cox of the Pittsburgh Commercial Heat Treating Company; "The Importance of Properly Heating and Cooling Steel," by J. A. Succop of the Heppenstall Forge and Knife Co.; "Manufacture of Springs," by D. A. Smith, Union Spring and Manufacturing Co.; "Change in Dimensions of High Speed Steels in Heat-Treatment," by M. A. Grossman, Electric Alloy Steel Company.

In the evening the members attended a smoker at which a motion picture showing the operation of an open hearth furnace was exhibited through the courtesy of the American Rolling Mills Co. This completed the technical phase of the convention, the last day being devoted to a meeting of directors and executives. The convention was closed with an entertainment on Saturday evening at Carnegie Institute.

Gary Counsels Optimism and Confidence in Future

Prefacing his remarks at the opening of the twenty-first annual meeting of the American Iron and Steel Institute, held in New York City on May 26, with a frank statement of confidence and optimism in the future of American business, Elbert H. Gary, chairman of the board of the United States Steel Corporation, delivered an interesting analysis of conditions in the United States, taking up legislative and industrial problems which directly affect the present. The meeting was well attended by prominent steel producers and manufacturers.

In a clear definite manner Judge Gary presented a message of common sense philosophy. It was a message filled with encouragement, and the earnestness with which he spoke greatly impressed his audience. What he said on the great subjects now foremost in the minds of the public, deserves the sober thought of every fair-minded citizen. The tariff revision he likened to an "intermittent disease," appearing at least with every change in administration if not with every session of Congress. He deplored the fact that the work done and the data collected by the National Tariff Commission at great expenditure of public money, had been entirely ignored. Today the tariff has become largely a local issue, favoring certain classes and not adjusted to suit the welfare of the body politic. That there is urgent need for a permanent tariff commission consisting of well paid and non-partisan men to adjust rates on a scientific basis seemed to him to be quite evident.

On the much discussed subject of the soldier bonus he counseled that final judgment be deferred. Because of the already heavy burden of taxation the country is not reaping the full limit of its opportunities; far better at this time it seemed to him to employ the funds required by a bonus bill in making the necessary extensions to industry so urgently required; that in thus furnishing employment the need for a bonus would be shown to be in a great measure unnecessary. If and when a bonus is paid the fairest method least likely to burden the people at large seemed to him to be by taxation, equally distributed. He said that he believed the sales tax represented the fairest method of all.

On the subject of Government in business he said that governmental regulation and investigation of industry was to be welcomed, provided it was conducted along non-partisan lines. He thought there was a disposition lately to exempt labor and farmer organizations from any such supervision. This exemption gave to such organizations power to do things beneficial to themselves but injurious to others—in short to create class distinction. He declared that governmental regulation could never be successful unless applied fairly and equally to all.

As to future business conditions Judge Gary held out great hopes. Though obscured at times since the signing of the Armistice, profitable business and general prosperity for all industries and for the people of this country are today nearer realization than at any time before.

At the banquet in the evening, held in the Hotel Commodore, Judge Gary presided. Earl French was the guest of honor.

Machinery Company Denied Another Hearing

On the ground that the case was heard twice before the Supreme Court and all phases of the controversy considered, Solicitor General Beck, for the Government, has opposed the motion of the United Shoe Machinery Co., for rehearing and modification of the court's decree in the case which banned leases of shoe machinery under the anti-trust law. He opposes authority being given the District Court to permit use of clauses in the leases which under other circumstances might not be violative of the law, on the basis that it would open up the case to endless litigation and defeat the effectiveness of the decree.

Veterans' Bureau Can Supply Trained Workmen

The United States Veterans' Bureau has 130,738 ex-service men in training status who are receiving instruction in every trade of industry and in agriculture. They are completing their courses at the rate of 500 a month. Manufacturers who want personnel trained in a particular vocation, are asked to write to the Rehabilitation Division, Employment Section, U. S. Veterans' Bureau, Washington, D. C.

The Government is conducting the largest trade and industrial school in the world in which more than 130,738 students are enrolled. The instruction in these vocations is furnished in leading colleges, technical and commercial schools, as well as in business establishments, shops and on farms. The men are in training in every state in the union and in every large city in the country. In all the large industrial centers the men who have received this intensive training from the Government are available for positions. Every vocation is represented and any employer who needs additional personnel will be furnished such personnel from his vicinity in short time by notifying the bureau.

These men are not permitted to terminate their training until the bureau is assured that they are skilled workmen and capable of carrying on in the vocation for which they are trained, and meet the requirements of the commercial, industrial and agricultural world.

The public has the impression that the majority of men who are receiving vocational training suffer from amputations. This impression is erroneous as statistics compiled by the bureau show that less than two per cent of the men in training suffer from amputations.

Employers who wish to employ these ex-service men who have been trained and whose ability to successfully carry on in a vocation has been assured by the training given, should correspond with the above address, state the type of personnel required, when the position is available and the place of employment.

General Conditions in Italy Show Better Business

Unemployment in Italy which reached the high point of 606,819 on Feb. 1, has registered 576,284 on March 1, and 498,606 on April 1, says a cable to the Department of Commerce from Mr. MacLean, commercial attaché at Rome. Business failures still reflect unsettled conditions in Italy, and during April totaled 277, as compared with 306 during the previous month, and 110 during April of last year.

The Bachi index of wholesale prices, based on the average price in 1920 of seventy-six commodities, registered 84.37 for April as compared with 85.43 for March, and 90.1 for February.

December exports were approximately 865,000,000 lires, an increase of 147,000,000 lires over those of the previous month.

Government expenditure during the five month's period of last year, July to November, amounted to 6,291,000,000. This represents a decrease of approximately 2,238,000,000 from those of the same period in 1920.

Germany's Labor Problem

Wage Regulations Retard Production—High Rents and Living Costs a Burden—Management Hampered by Union Rules—Exchange the Barometer of Business

By OUR BERLIN CORRESPONDENT

(Continued from last week's issue.)

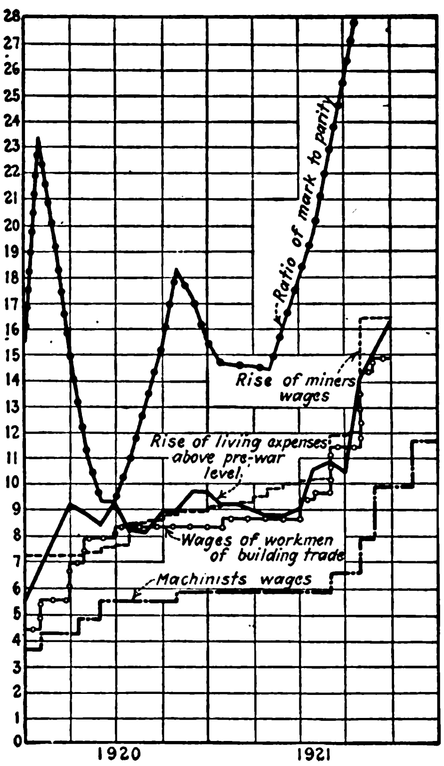
It is part of the labor regulations that wages are settled by agreement between employers' associations and employees' unions. Such agreements, called "wage tariffs," are concluded in large towns locally, in small towns and in the country for districts. They are contracted for a specific time, sometimes a year, but can be terminated by notice of a month or so, according to special arrangements. They include also stipulations for additional payments like subsidies to wife and children, provisions for holidays, and stipulations for piecework payment, especially the minimum earnings granted to pieceworkers.

The network of regulations, cleverly woven round the wage problem, naturally acts as a retarding force. Spread over the whole field of production and exercised with special care and exactness where necessities of life are concerned (in which respect it is further helped by the criminal law dealing with excess profits), it has enabled the administration to keep prices down, even after the control of prices on food stuffs and other commodities has been removed. It is, however, very doubtful whether this expedient will work permanently. Recent developments, resulting in an upward rush of all prices, are rather alarming in this respect. They are, of course, caused by the unprecedented depreciation of the currency, but the disquieting side of it consists in the fact that prices by their great inertia will not stop simultaneously with the exchange fluctuations.

The Rent Factor

Deliberate actions of the government to keep prices down have in the course of time diminished to the care taken of grain prices exercised by contributions from public funds. This last remnant of the control of food stuffs has recently been abandoned, and the insignificant reaction on the living cost is proof of the fact that this measure has in its import been greatly overrated. There is, however, another factor which is of far greater importance, and deserves special attention, not only because it is frequently overlooked by observers from outside, but also because it will supply the administration with an effective control of living costs long after all other means will have ceased to work. This is the rent factor which absorbed in pre-war times from one-third to one-fourth of the average workman's income. This part of his expenditure has, however, only doubled. If the prices of all commodities would reach the equivalent of the pre-war standards, and the workman had to be paid accordingly, he could not claim increase of the part of his income going towards housing expenses, except for the insignificant doubling of his rent which, apart from all other factors, would allow his income to be kept down below pre-war level by from 25 to 30 per cent. This is important in view of the much feared approach of prices to the gold standard. It appears, therefore, that the property owners are carrying to a large degree the burden of the administration's labor policy.

The following diagram shows five interesting curves, which held together are a very lucid illustration, not only of the labor problem but of Germany's whole industrial situation.



The first curve shows the movement of the exchange, the second that of the living cost. Of the three stepped curves, the first indicates the movement of the wages of the miners, the second that of the building laborers, and the third those of the machinists. The diagram extends over the years 1920 and 1921. The abscissa in the diagram demonstrate the ratio of the respective figures to the pre-war level. The curve of depreciation (ratio to parity) only reaches as far as September, 1921.

Regarding living cost, it should be mentioned that the exactness of the statistic index figures upon which the diagram is based is strongly questioned, not only by the workingman but also by a number of economists. It is contended that if the index figures were composed in a way conforming with pre-war living standards, and not with apparently much lower ones, they would show a much stronger deflection. Comparing living costs with money depreciation, it is seen that the first are in some measure following the latter, leaving a wide margin between. It is interesting to note that the recovery of the currency in 1921, extending from January almost to July, is hardly reflected in the living expenses, although the reversion was sharp. Though the curve of living costs show a number of fluctuations, its upward tendency as a whole is unmistakable.

In none of the three groups of workmen seen in the diagram, nor in any other, have wages ever been reduced, not even when the currency recovered from nearly 100 to 39m. to the dollar. On the contrary, the unbroken upward movement of wages in the time corresponding with that recovery was rather marked. This fact will explain the prevalent fear that in the case of a future reverse of the exchange movement, with conflicting conditions so much more pronounced than in 1920, the curves representing money and cost of labor might one day intersect, which point would no doubt mark a most severe crisis.

Divergence of Rates

It is peculiar to note how far the wages of the three groups represented in the diagram differ. The wages of miners and for building labor keep close together; the wages of the machinists' unions, which comprise all workers in the metal industry, are remaining however far below. The wages of the miners follow closely the movement of living costs, and have in places even gone beyond them. This is due to the fact that the miners occupy a rather privileged position among the workmen. With regard to building laborers, the explanation is not so easy. The reason is that building laborers have during the war and the years immediately following, in a large number joined other vocations, and cannot be persuaded to return to their old trade, unless special inducement is offered. In spite of the small amount of building work going on, workmen are scarce, a condition which gave the unions a clue to put forward claims for higher wages than are paid to other groups of workmen.

Much has been written and said about the unhealthiness and hot house nature of German prosperity, and although the arguments derived therefrom have been frequently used for the country's cause in the reparations problem and are probably flavored, they are by no means without foundation. The manufacturers are pointing out incessantly that, granted equal conditions with foreign rivals, German industry could not compete with them. Any one going through German factories—even at the present time, when intensity of production is at its highest, calling forth all reserves of energy—can bear witness that this complaint is correct in a large measure. It must be remembered that the way traversed since the revolution is marked by a forced retreat on the part of the employers, strewn with concessions to the workmen, cutting deep into the scope of management of the works.

The eight-hour day is declared by the

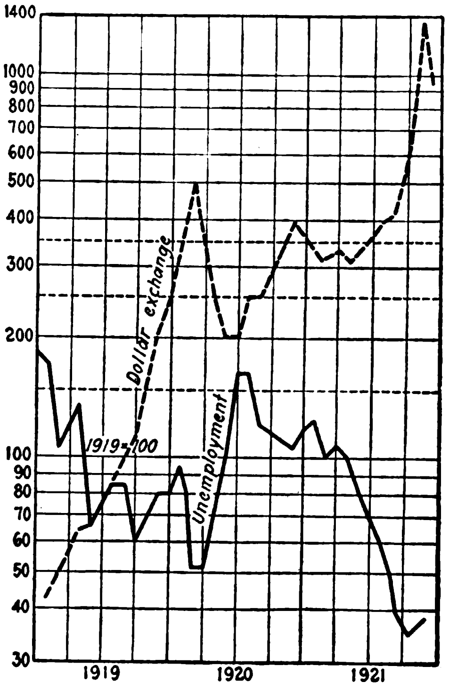
employers to be the greatest evil inflicted upon them. The shop council law, with the strong protection it gives the workman against dismissal, the prohibition of overtime, and the large financial burden the employer has to bear for providing towards workmen's welfare institutions, are further adding to the discontent. The workmen on their side are dissatisfied by the extent of concessions they have derived since their ascendancy to power. If disorganization and dissolution have not set in, and gradual recovery even taken place, it is not the fault of the new state of affairs, but solely due to the innate discipline and industriousness of the race. Quite apart from other conditions, the impossibility to dismiss workmen for incompetence suffices to frustrate all efforts to develop efficiency and exercise economy. Nothing has been done yet to make the best of the new order of things. Hardly anywhere have attempts been made to speed up the working process in compensation of the reduced working time. Manufacturers declare that such speeding up is impossible in view of the frame of mind of the workmen.

In this contention they are believed. They are solely dependent on the good will of the workmen. If the latter feel like spending an hour over work which could be done in half the time, the manufacturer cannot interfere. If there is not sufficient work, time is "stretched," otherwise it is also stretched because there is no spur for filling it adequately with work. Existing regulations prevent anything which would reward diligence and punish laziness. The spirit of equalizing, the basic socialistic doctrine, is ruling the whole situation. Differentiation is most effectively eliminated. The working speed and the economy which manufacturers can effect are those that the workmen accord them voluntarily from their sense of duty and honor. That the results are not exactly poor speaks highly for both. But even as it is, economy and efficiency in production have sunk considerably below the prewar standard. The individual efficiency of the workman may in the average have reached 60 per cent of the old standard, but in the case of economy this percentage is much less.

Spirit Lacking

This is not entirely due to remissness on the side of the laborers, but in a large measure to an entirely disproportionate increase of overhead, depreciation of machinery, inferior quality of tools, and last but not least to the whole system lacking spirit and "pep." Moreover, it can be noticed that workmen, as well as manufacturers, have frequently lost all sense of economy, doubtless due to the continuous depreciation of money and because the elasticity of its value has so far saved manufacturers from feeling the pinch. They seem to have forgotten the old methods of making both ends meet, and are relying upon the vicious circle, which is in the habit of closing up automatically between increased cost by a rise of sale prices contingent with a further depreciation of the currency.

Probably the most dangerous item of the unhealthy conditions prevailing consists of the fact that business is not ruled as it used to be by the laws of supply and demand, but by the money exchange. A little diagram recently prepared by the State Bureau of Statistics shows two curves. One depicts the extent of unemployment; the other the exchange of the dollar in Berlin. The chart demonstrates this clearly.



In explaining the way this diagram is drawn up, it should be mentioned that the graduation of the abscissa is not equi-distant but in the logarithmic order, which it is alleged more clearly demonstrates the run of a curve. If, for instance, the mark would drop from 30 to 15 cents, this would in an ordinary diagram be expressed by a large drop. If, however, it sunk from 1 to ½ cent, the deflection in the diagram would hardly be visible, although it would mean a drop from 100 to 200m. to the Dollar. In the diagram the curves representing unemployment and the movement of the dollar exchange in Berlin are running exactly counterwise. The dependency of business on the fluctuations of the exchange is even increasing as the movement of prices is more and more drawn into the vortex. Up to now, it has been possible to preserve a certain continuity of prices, but during the last months a growing tendency has become noticeable of prices quickly following the inflections of the currency. This is no doubt due to the fact that the prices of a number of commodities of everyday use have already reached pre-war parity, and for this reason are bound to follow the lead of the money market, thereby influencing the rise and fall of the whole market to a certain degree. The money exchange has become the business man's barometer. Like the seaman's first glance in the morning is up to the sky, the German business man's first look is at the dollar exchange. This state of things would probably not be so dangerous if the money market were controlled with a view to maintaining a certain steadiness, or if at least it were left to itself. But this is not the case. The relation of the mark to the dollar is by no means ruled solely by the state of the finances, but rather strongly by hopes and disappointments, based upon happenings of the most divergent nature, political and economic. This picture of Germany's economic life is unique and full of unhealthy perversity. Jokers say that when Lloyd George smiles in Genoa, eggs get cheaper in Berlin. This is not a mere jest but contains more than a grain of truth. It is certainly true that a number of mark speculators, bulling or bearing it at will, are able to shake the whole structure of business life to the very foundations. All the institutions devised to protect the business man against the effects of currency fluctuations and contracts concluded in foreign standard currency, are of no avail in such emergencies. The trend of business bears no more semblance to a uniform current but rather to a whirlpool full of eddies and undercurrents, making navigation extremely difficult and dangerous. In view of this picture, the prosperity seen everywhere looks puffed up and unhealthy.

A Great Wage Problem

Although the advantages of a stabilized currency are obvious and realized everywhere, the feeling among business men in this direction is divided. There is no doubt that in the case of a stabilized exchange, no matter in what relation to parity stabilization is effected, prices and wages would adjust themselves to the standard of currency, and gradually run up close to it, thus diminishing the economic advantages producers now enjoy. Stabilization of the currency would squash all hope of a future improvement of the exchange. This hope plays an important part in the present scheme of things. If wages and prices are soaring up, a timely arranged bulling of the mark has never failed to check this movement. A good many of the arguments used to keep wages down rest upon the unsettledness of the exchange. The most effective argument, for instance, against the strongly advocated scheme of putting wages on a sliding scale is supplied by the possibility of a recovery of the exchange, in which event the wages would be forced down. If this is accompanied by a "propaganda of hope" through the public mouthpieces, and with fluctuations of the exchange clearly demonstrating that the mark might go up as well as down, a state of uncertainty is produced which so effectively dims the vision of everyone that the treatment of the labor problem can follow the crooked course into which economic conditions force it, without it becoming clearly visible to the observer.

Moline Plow Reorganized

The Moline Plow Co., Moline, Ill., has been reorganized and has taken in the Stephens Motor Car Co. as a subsidiary. The new company is being launched with $16,000,000 of current assets and with all current indebtedness cleared from its books, except a few accrued current expenses. The officers of the reorganized company are: President, George N. Peek; vice-presidents, H. S. Johnson, R. W. Lee, F. W. Edling, C. B. Rose and H. B. Dinneen; secretary, L. C. Shonts; treasurers, F. N. Honeigman and John Hammerich. Frank O. Wetmore, president of the First National Bank of Chicago, is chairman of the board.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE

Editor, *Commerce and Finance*, New York

A 10 per cent reduction in our railway freight rates and a meeting of the world's greatest bankers in Paris to consider lending between one and four billion dollars to Germany were the outstanding events of last week in the business world.

Their significance is not yet appreciated or rightly understood. In the stock market the reduction in freight rates was unfavorably construed and this construction was reflected by a slight decline in railway shares. It will be short lived, for the lower rates will greatly augment the traffic and bring an increase in gross earnings that will benefit both the country and the carriers.

When about two years before his death I was talking of railway rates to the late E. H. Harriman he said: "Price, give me the gross and I will take care of the net. The earnings of a railway depend upon the density of its traffic. If I can get all the freight I can haul that is all I want."

In these epigrams Mr. Harriman briefed the policy that made his roads successful. The larger the traffic the cheaper he was able to carry it, and I venture the prediction that the increase in gross revenue which will follow the rate reduction ordered last week will be so surprising that the railways will themselves take the initiative in applying for a further reduction. Cheaper transportation and greater profits I believe would be the effect if Secretary Mellon's proposal for removal of government restrictions on rate making for five years were adopted, though there is little likelihood that it will win public support. But as the reduced rates do not take effect until July 1, reduced earnings are to be expected during June because those who can will delay shipments until the new rates apply.

A Revival in July

I have previously named the first of July as the date upon which a countrywide revival of business would be due and the fact that it is upon that day that the lower freight rates take effect increases my confidence in the coincident arrival of a business boom.

Transportation is the very life blood of economic civilization and anything that tends to cheapen the cost of carrying goods from the producer to the consumer must make for prosperity. It is to be hoped that the Interstate Commerce Commission will soon order a reduction in passenger rates. As Commissioner Cox pointed out the passenger traffic is now 7,000,000,000 revenue passenger-miles below normal and from this statement some idea can be had of the increase in travel which would follow a return to prewar rates.

As to the German loan that is under consideration at the bankers' conference in Paris, it can probably be taken for granted that a bond issue will be arranged on some terms. The amount, the rate and the security are of course undetermined as yet, but a loan that will be sufficiently large to take care of her reparation payments until Germany gets on her feet is so obviously necessary and desirable that it is safe to assume that it will be made.

There are some who doubt whether any substantial proportion of such a loan would be subscribed in the United States, but leading bankers here think differently and believe that at least $500,000,000 gold bonds could be sold in this country if the rate were sufficiently attractive. This belief is based upon the theory that such a loan would greatly aid in liquifying the debts due our merchants and banks by Europe and South America and that our financiers will leave nothing undone to insure its success.

The soundness of this theory is unquestionable and as the arrangements for the loan approach consummation further buoyancy in the stock and commodity markets is to be expected.

Markets Are Sound

The confident tone that has recently prevailed in these markets showed no abatement last week. Copper is now up to 14 cents. Sugar is firmer and as the surplus supply disappears higher prices seem indubitably indicated. Rubber is steady and the activity in the tire business is commencing to make an impression upon the American stocks of rubber. Cotton has been steady. Everyone is bullish on cotton and the position is statistically strong, but it should not be forgotten that the crop generally improves during June.

The iron and steel industry is almost booming, but the much-talked-of mergers are held up pending the approval of the Attorney-General. As a speculative influence their effect is probably spent. Wool and silk are again higher and the dry goods market shows more activity from day to day.

The New England textile strike is gradually wearing itself out. It has so wearied the New England manufacturers that many of them are talking about moving South, but it is unlikely that any of them will actually move, though it is to be doubted whether many more cotton mills will be built in the North.

Money is still easy, though the increased borrowing of New York stock brokers is gradually absorbing the surplus funds of the New York banks.

Thomas A. Edison's proposal that the Government should build warehouses for the storage of farm products against which Federal Reserve Notes should be issued for half the average value during the previous 25 years, has attracted not a little attention and is said to have been favorably received by some of the farm "bloc" in Congress. It appeals to the agrarian imagination, but no attempt to give it effect seems likely.

The sale of 40,994 shares of the stock of the National Bank of Commerce in New York at $267 per share for account of the Mutual Life Insurance Co. and the Equitable Life Insurance Co. of this city is something of novelty. The stock was sold within two hours and the success of the offering may indicate that the investment demand is shifting from bonds to stocks. Fewer new securities are being floated and more stock issues are appearing among them. The demand for funds for current business uses is increasing and as industrial improvement continues the money market will surely tighten. Country banks are said to have been active buyers in the bond markets, employing funds which business probably will want within a few months, and steady expansion of Federal Reserve rediscounts is to be looked for. Perhaps it is already under way, for the report of the system for the week ended May 24 shows that bills on hand totaled $592,604,000, an increase of nearly $30,000,000 over the previous week. It was offset, however, by the acquisition of $2,500,000 additional gold, and the reserve ratio shows only a one point decline to 77.5 per cent.

The apathy with which the coal strike is regarded is not favorable for its early settlement. The union leaders seem to have picked the time for the strike with more shrewdness than was generally considered, for it is reported that in some fields reviving industry is making it easy for the strikers to find sufficient work to keep them alive and they are holding out better than seemed possible. On the other hand industry professes to be well supplied for at least two months yet, and the strike is not likely to create a critical condition until July. Of almost as great importance is the setback which the building boom is experiencing in New York and Chicago through labor troubles, including bombings, strikes, and the intolerable jurisdictional disputes of the unions.

These are the black spots of the picture. They are almost invisible in the sunshine which floods the view. Though we realize that there are clouds which, arising in Washington or Europe, may appear over the horizon, for the present it seems perfectly safe to venture out without an umbrella.

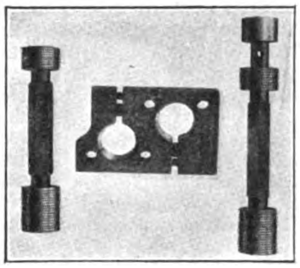
Machinists in U. S. Best Paid in World

In a Senate tariff debate last week, Senator Gooding of Idaho gave the average daily wage of machinists in various countries. In the United States he stated they were $6.40; in England $2.90; in France $1.38; in Japan $1.50; in Italy 82 cents and in Germany 72 cents. The Senator gave these figures as an argument for protecting the American workmen against the products of cheaper labor.

Condensed-Clipping Index of Equipment

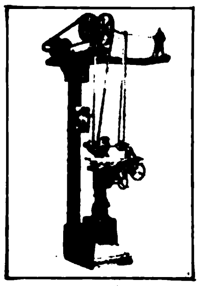
Patented Aug. 20, 1918

Gages, Spark Plug, Limit, "Trilock"
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," February 2, 1922



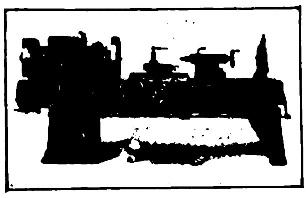
The gage set is made to S.A.E standard limits and consists of a double-end limit plug gage, a "go" and "no-go" templet in one unit, and a setting plug for the templet with a cylindrical plug for checking the root diameter. The pitch diameters of the plugs are 0.841 and 0.843 in. and the tolerance for tapped holes is 0.002 in. The templet pitch diameters are 0.836 and 0.839 in., giving 0.003 in. tolerance for the threads on the body of the spark-plug. There is a neutral zone of 0.002 in. between the maximum spark-plug and minimum hole sizes.

Grinding Machine, Motor Drive for
Grand Rapids Grinding Machine Co., Grand Rapids, Mich.
"American Machinist," February 2, 1922



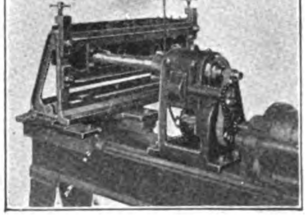
This arrangement for motor drive is applied to the No. 1 universal grinding machine. The stand consists of a cast-iron base, into which is screwed an upright section of heavy iron pipe, carrying at its top a table casting to which are bolted the motor and countershaft. The grinding machine is bolted to the base casting. The starting switch is located on the column, directly back of the machine. Any make of motor may be used and a reasonable variation in motor speeds is allowable.

Lathe, Engine, Coneless, Geared-Head, 18-in.
Boye & Emmes Machine Tool Co., Cincinnati, Ohio.
"American Machinist," February 9, 1922



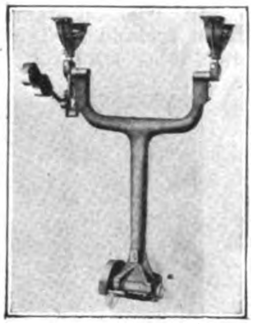
The headstock, reversing gear and arrangement for mounting the driving motor are different from the standard lathe design. Twelve spindle speeds are obtained by shifting the jaw clutches. The spindle is controlled by a vertical lever on the apron and an auxiliary lever below the headstock. The range of spindle speeds is from 9 to 350 r.p.m. Longitudinal and cross feeds cannot be engaged while screw-cutting. Forty threads, from 2 to 56 per in. can be cut without changing gears. Feeds, ⅛ to 224 per in. Floor space, 10 x 3 ft. Weight, 4,270 lb.

Grinding Attachment, Cylinder, Lathe, "Elteco"
Liberty Tool Co., 1080 Springfield Ave., Irvington, N. J.
"American Machinist," February 9, 1922



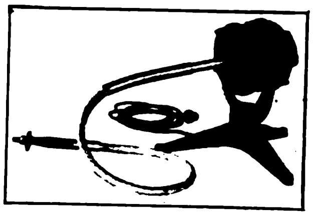
The machine is attachable to an engine lathe having a swing of 14 in. or more. The work holder is mounted on the lathe carriage, the spindle head on the ways; and the headstock of the machine drives the rotary feed of the wheel spindle. Spindle drive is by means of a ⅓-hp. electric motor. An eccentricity up to 1 in. in diameter can be obtained, the amount being varied by a screw graduated to 0.0005 in. Cylinder bores from 2⅞ to 7 in. in diameter can be ground. Longitudinal work feed is obtained by using the lathe carriage feeds. Spindle speed, 5,600 r.p.m. Weight, 00 lb.

Saw, Cut-Off, Swing, Motor-on-Arbor, No. 36
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," February 2, 1922



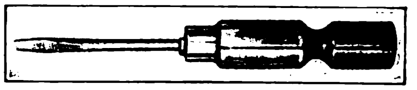
The machine is made with three frame lengths, 5 ft. 5 in., 7 ft. 5 in., and 9 ft. 5 in. The motor operates on three-phase, 60-cycle, 220 or 440 volt alternating current, has 3 hp., and runs at a speed of 3,600 r.p.m. The saw carried is ordinarily 16 in. in diameter and is protected by a guard. The motor is controlled by a push button above. The device can be furnished with the motor mounted on top of the swinging bracket and belted to the saw arbor, or larger size saws can be driven from a countershaft.

Grinder and Buffer, Flexible-Shaft
Valley Electric Co., St. Louis, Mo.
"American Machinist," February 2, 1922



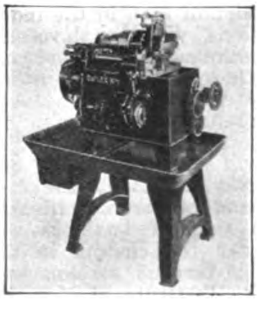
The ball-bearing motor used to drive the wheel is mounted in trunnions in a fork that is carried on ball bearings for swiveling the motor in any direction. The flexible shaft permits the wheel to be moved to any position. Different types of abrasive wheels may be employed. The device is made in both ¼ and ½ hp. sizes to operate on either 110- or 220-volt alternating current of 60 cycles and one- or three-phase, or on direct-current of the same voltage. Bench space, 14 in. square. Weight, 80 to 100 pounds.

Screwdriver, Ratchet, Hand
H. D. Chapman, 2929 Clifton Ave., Baltimore, Md.
"American Machinist," February 9, 1922



The device is made in three sizes. With it a strong torque can be obtained on the screw at the same time that the axial pressure is applied. The top of the handle is rigidly fastened to the shank or blade. The lower part of the handle at the center of the tool is free to rotate about the shank. By means of a ratchet device, this lower handle may be engaged with the blade so that it is free to turn in one direction only. This direction may be reversed.

Forming Machine, Cutting-Off, Duplex
L. P. Brown Machine and Tool Co., Attleboro, Mass.
"American Machinist," February 9, 1922



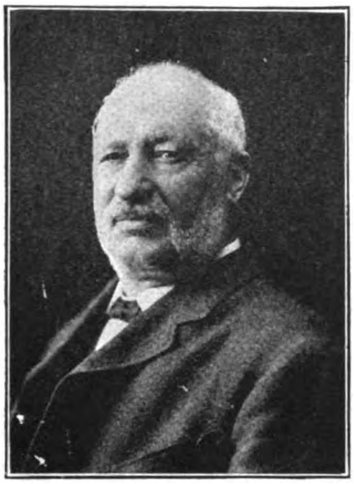
The machine forms and cuts off parts not requiring turret tools, but ordinarily machined on an automatic screw machine. It has two spindles. A two-speed countershaft provides 6 feed changes from 240 to 1,820 r.p.m. The feed, independent of the forming movements, may be set to any length up to 3 in. Forming tools independently adjustable and carried on a single cross slide, operate simultaneously. Cut-off tools are carried on slides at an angle of 30 deg. to the vertical to allow clearance between the forming and cut-off tools. Floor space, 44 x 26 in.

Clip, paste on 3 x 5-in. cards and file as desired

William Gleason, of Rochester, Dead

William Gleason, pioneer manufacturer of machine tools, and president of the Gleason Works, of Rochester, N. Y., died at his home in that city on May 24. He was 86 years old.

Mr. Gleason came to this country from Ireland in 1851 and learned the machinist trade in the shop of Asa



WILLIAM GLEASON

Smith in Rochester. During the Civil War he worked in Colt's Armory in Hartford, Conn.

In 1865 he returned to Rochester and organized the nucleus of the present machine works. In 1873 he perfected what is said to be the first practical bevel gear planer. Since then he has turned out several important improvements in the design of gear planers.

Of late years he has been inactive in the management of the Gleason shops, leaving that to his son James E. Gleason. A daughter, Kate Gleason, is a vice-president of the company, and is one of the few mechanical engineers of her sex in the country. She is well known for her designs of gear machines.

American Foundrymen in Rochester Next Week

Plans have practically been completed for the annual convention and exhibit of the American Foundrymen's Association to be held in Rochester, N. Y., June 5 to 9. A comprehensive program of technical papers covering every phase of the foundry and allied industries has been prepared by the committee on arrangements. The speakers include some of the most important men in the industry. Nine sessions will be devoted to reading of technical papers and committee reports. There will be an international session at which papers by American, British, French and Belgian foundrymen will be read and discussed. Other sessions will include steel, brass, aluminum, gray iron, industrial relations, molding sand research, malleable cast iron and a general business session. As has been the custom in the past, a joint non-ferrous session will be held with the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers.

The exhibit is expected to be one of the largest ever held.

Amortization Requirements

Regulations 62, relating to Income Tax and War Profits and Excess Profits Tax, under Revenue Act of 1921, provide, in respect to amortization of war facilities, Article 184 (2), that in the case of property subject to amortization, the value in use shall be "not greater than the estimated cost of replacement under normal post-war conditions, less depreciation."

Prior to the promulgation of Regulations 62, it was not possible to amortize war facilities, which were in full use in a going business. The new regulations, however, provide, as indicated above, for amortization of what is commonly referred to as excess cost. Roughly speaking, the amortization which might be allowed on such a facility would be the difference between the original cost and the estimated normal replacement value. The accumulation of data necessary to establish such normal replacement cost is necessarily a considerable task. Engineers of the amortization section have already called upon a majority of the machine tool manufacturers and have secured such data as was requested. There are, however, a number of manufacturers who have not yet been asked for this information. The writer has been informed that it is the intention of the Bureau of Internal Revenue to write to such manufacturers requesting this information. This data is to be used, as indicated above, to determine the difference between the cost of machine tools during the war and the cost of the same articles under post-war conditions. This information is necessary in order to enable the department to determine proper allowances for amortization and all prices are held strictly confidential.

Where such information is not on file in the Department, there is either a delay while it is being secured, or if the manufacturer is unwilling or dilatory in supplying it, the claim is necessarily settled without it—possibly to the detriment of the taxpayer.

It is evident, therefore, that the work of the amortization section will be greatly expedited if all requested data, as indicated above, is furnished by the manufacturer. The settlement of income tax claims tends to stabilize conditions in the machine tool industry, and also among the machine tool builder's customers. This is an indirect result that follows.

As the latest current price on any article is also a factor in determining normal post-war replacement costs, it is essential that the latest prices be on file in the department at all times. It is recommended that machine tool builders furnish this information to the chief of amortization section as soon as any new lists are issued. This information will, of course, be held strictly confidential.

Henry H. Morse, Chief of Commerce Division

Secretary of Commerce Hoover has announced the appointment of Henry H. Morse, of Boston, to be chief of the specialties division of the Bureau of Foreign and Domestic Commerce. The appointment becomes effective July 1. Mr. Morse brings to the bureau the wide experience in the export trade, an intimate acquaintance with foreign markets and a wide practical knowledge in the field of specialties. He is well known in New England business circles, having served as chairman of the Boston Export Round Table since 1919, and as chairman of the committee on Trade Expansion of the National Boot and Shoe Manufacturing Association. He was honorary vice-chairman of the National Foreign Trade Convention in Cleveland, in 1921, and is at present the director of the New England Chamber of Commerce, and chairman of the Advisory Committee on Foreign Mails.

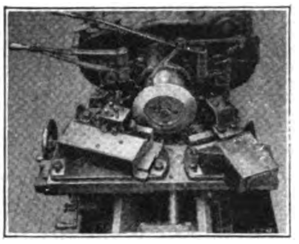
DOMESTIC XPORTS OF METAL WORKING MACHINERY FROM THE UNITED STATES, FOR THE MONTH OF MARCH, 1922

Countries	Lathes Number	Lathes Dollars	Boring and Drilling Machines Number	Boring and Drilling Machines Dollars	Planers, Shapers and Slotters Number	Planers, Shapers and Slotters Dollars	Milling Machines Number	Milling Machines Dollars	Sharpening and Grinding Machines Number	Sharpening and Grinding Machines Dollars
Belgium	1	1,099	...	......	1	41	..	......	3	350
Denmark	1	1,435	...	......	..	......	..	......	...	......
France	3	2,266	...	......	4	4,014	5	5,441	8	3,087
Greece	...	......	...	......	..	......	1	100	30	113
Latvia	4	1,809	1	60	..	......	..	......	...	......
Netherlands	...	......	4	85	..	......	..	......	32	139
Norway	...	......	2	145	..	......	..	......	1	936
Spain	2	2,611	3	575	..	......	..	......	41	2,087
Sweden	...	......	2	985	1	1,165	..	......	...	......
England	3	438	1	1,348	..	......	2	392	36	16,188
Scotland	...	......	...	......	..	......	1	140	...	......
Canada-Maritime Province	...	......	1	174	..	......	..	......	45	188
Quebec and Ontario	21	10,193	30	1,653	3	199	7	2,459	171	17,797
Prairie Province	3	800	1	9	..	......	..	......	38	658
British Col. and Yukon	2	3,028	...	......	..	......	..	......	14	296
Mexico	18	15,846	20	7,657	1	1,148	9	1,117	9	520
Cuba	3	1,269	...	......	..	......	..	......	2	169
Argentina	6	119	...	......	..	......	..	......	...	......
Brazil	3	31,881	1	12,182	..	......	..	......	57	827
Chile	1	718	...	......	..	......	..	......	1	669
Colombia	5	8,881	...	......	..	......	..	......	...	......
Peru	...	......	...	......	1	2,328	..	......	...	......
Venezuela	2	1,019	...	......	..	......	..	......	15	71
British India	...	......	93	1,292	..	......	3	2,560	2	1,435
China	6	5,295	3	416	1	350	..	......	2	135
Other Dutch East Indies	...	......	1	52	..	......	..	......	...	......
Japan	11	14,866	4	24,284	7	10,640	4	4,479	31	4,709
Palestine and Syria	2	1,012	...	......	..	......	..	......	...	......
Philippine Islands	1	300	...	......	..	......	..	......	7	765
Australia	1	347	1	180	..	......	9	9,129	27	196
British South Africa	13	660	...	......	..	......	..	......	7	41
British East Africa	1	659	...	......	..	......	..	......	...	......
Total	113	106,551	168	51,097	19	19,885	41	25,817	579	51,378

Condensed-Clipping Index of Equipment

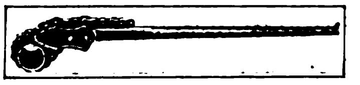
Patented Aug. 20, 1918

Attachment, Lathe, Bevel-Gear Turning
Warner & Swasey Co., Cleveland, Ohio.
"American Machinist," February 9, 1922



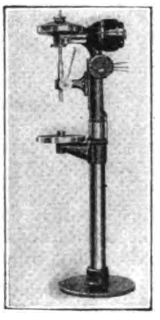
The attachment is used on No. 3-A universal, hollow-hexagon turret lathe when machining bevel-gear blanks. It is interchangeable with the top slide of the lathe carriage, and cuts all standard angles on blanks up to 14 in. in diameter. Two tool slides are operated by the hexagon turret and saddle. A shaft mounted on the turret engages a double pinion in the saddle, and transmits motion to the tool slides. The front slide operates on one side of the gear and the rear slide on the other, both moving at the same time.

Wrench, Pipe, Chain
Armstrong Bros. Tool Co., Chicago, Ill.
"American Machinist," February 9, 1922



The wrench jaws are provided with long bearings on the bar, and with flanges to guide the chain and to protect it from abrasion. Two types of chain can be furnished, the flat-link style as shown, and the cable-link chain. The wrench is made in seven sizes, for use on pipe and fittings from ⅜ to 16 in. Wrench length, 20 to 78 in. Chain length, 13½ to 72 in. Weight 5¾ to 98 lb.

Drilling Machine, Sensitive, Electric, Motor-Driven, 12-in.
Louisville Electric Mfg. Co., Louisville, Ky.
"American Machinist," February 9, 1922

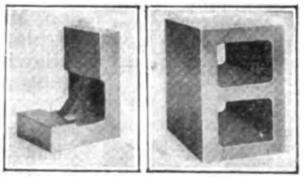


The speed of the spindle can be easily adjusted. The table is counter-balanced by a weight in the column. A ½-hp. motor running at 1,725 r.p.m. is used. The motor and controlling switch are built in the machine, the motor being furnished to suit the available circuit. The machine is made in both bench and floor types, and is furnished with a V-block, cup and point centers. Capacity, up to ½-in. hole in the center of a 12-in. circle. Spindle speed, 450 to 1,200 r.p.m. Height, 76 inches.

Sand Blast, Portable, Hose-Type, Small Size
Pangborn Corporation, Hagerstown, Md.
"American Machinist," February 9, 1922

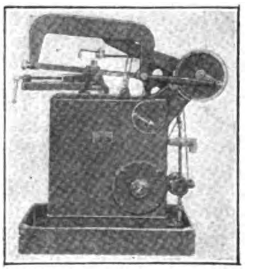
The hose machine consists of a suction-type gun controlled by a trigger in the handle. The motion of the compressed air carries the sand from the hopper to the gun body. The body forms a mixing chamber for the air and abrasive, giving it a swirling action. Nozzles are interchangeable. The blast operates on any air pressure from 5 to 100 lb. A small cabinet that can be set over the hopper of the hose sand-blast, as illustrated, can be supplied for cleaning small parts.

Toolmakers' Knee and Box Parallel, Precision
Simplex Tool Co., Woonsocket, R. I.
"American Machinist," February 9, 1922



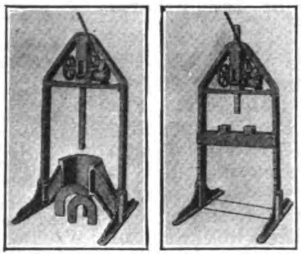
The toolmakers' knee, adapted for gage and small work, may be used for both inspecting and laying out work either with or without a magnetic chuck and clamped directly to any surface. It is made in one size, 2½ x 3 x 4 in. The precision box parallel, for larger work than the ordinary parallel, is used in either the machine shop or toolroom for inspecting and laying out large work. It is made in four sizes from 4 x 4 x 6 to 6 x 14 x 16 inches.

Sawing Machine, Hack, Motor-Driven
Louisville Electric Mfg. Co., Louisville, Ky.
"American Machinist," February 9, 1922



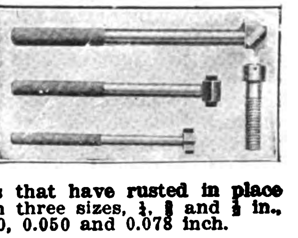
The vise swivels and is graduated. The stroke length is adjustable from 5 to 7 in. Two speeds, 45 and 90 strokes per minute, are provided. Stock up to 5 in. thick can be cut. The feed is by gravity, and the saw arm can be raised and held in any position. An automatic stop shuts off the motor when the piece has been cut off. The motor has a capacity of ¼ hp. and is fitted with ball bearings. The machine can be mounted on wheels. Floor space, 18 x 36 in. Height, 36 in. Weight, 450 lb.

Press, Arbor, Garage, Hand-Operated
Evansville Arbor Press Co., Evansville, Ind.
"American Machinist," February 9, 1922



Presses Nos. 8 and 9, shown on the left, have stationary tables with 10-in. openings. The table on the Nos. 8-B and 9-B presses, shown at the right, consists of a pair of adjustable side bars. The uprights are channels 40-in. apart. A handwheel provides for quick return of the ram. Work diameter, No. 8, 30 in.; No. 9, 40 in. Largest arbor opening, 8 in. Capacity over table: No. 8, 27½ in.; No. 8-B, 36 in.; No. 9, 30 in.; No. 9-B, 44½ in. Weight: No. 8, 585 lb.; No. 8-B, 450 lb.; No. 9, 715 lb.; No. 9-B, 585 lb.

Screwdriver, Offset, "Utility"
Porter Products Corporation, Brewerton, N. Y.
"American Machinist," February 9, 1922



The device is used in close quarters, being developed for automobile use. It operates with the handle at right angles to the screw. On each of the four sides of the head is a blade set at an angle of 45 deg. to the one on each side of it. The tool is rotated between each stroke to bring a different blade into use. Because of the leverage, large wood screws or machine screws can be easily set up, or screw bolts that have rusted in place can be loosened. The tool is made in three sizes, ¼, ⅜ and ½ in., the thickness of the blades being 0.040, 0.050 and 0.078 inch.

Clip, paste on 3 x 5-in. cards and file as desired

Business Items

Beginning June first, the Arrow Tool and Manufacturing Co., of Bridgeport, Conn., will be known as the Forsberg Manufacturing Co. The change is being made because another company in the same field has a prior right to the name "Arrow."

The Modern Machine Tool Co., Jackson, Mich., has taken over the stock and machinery of the Sprague-Hayes Manufacturing Co.

The Reliance Steel and Tool Co., of New York, has moved its offices from 24 Murray St., to 30 Church Street.

The Spafford Machine Screw Works, Inc., of Hartford, Conn., has filed a voluntary petition in bankruptcy in the U. S. District Court at New Haven; showing liabilities of $40,638 and assets of $25,314.

Jenkins Bros., manufacturers of valves, etc., Bridgeport, Conn., following conferences with the workmen, decided to go on a five-day per week schedule. The company has been working six days, but in changing to the five-day schedule, the working hours will not be affected, as the new schedule will be arranged so as to get in the forty-eight hours per week.

The Remington Arms Co., Bridgeport, Conn., has recently incorporated under the laws of the State of Connecticut, as a separate corporation, the Remington Cutlery Works, to manufacture pocket cutlery, etc. The capital of the cutlery branch will be $25,000, and the incorporators are: Chauncey B. Garver, William B. Stitt and Charles R. Barrett, all of New York city. There will be no change in the management or policy of the company, and the new firm will be operated as a subsidiary of the larger concern. The knives will be manufactured in the Bridgeport plant.

The Hampden Grinding Wheel Co., of Springfield, Mass., has been incorporated under the laws of Massachusetts, to manufacture grinding wheels, etc. The firm will take over the present plant and business of the Hampden Corundum Wheel Co. in that city. The capital stock is $100,000 and the incorporators are Willard P. Leshure, John M. Collins and Frank S. Hatch. Mr. Leshure, who was president of the old company, will be the president of the new concern.

The Murmac Manufacturing Co., Inc., of Gloucester, Mass., has been incorporated under the laws of Massachusetts to conduct a general machine shop, etc. The capital stock of the new company is $25,000; the incorporators are John A. Moran, David F. Murphy and Morgan J. McSweeney, of 247 Essex St., all of Salem, Mass.

The Merwin Screw Co., Inc., Bridgeport, Conn., recently incorporated to manufacture and deal in screws, etc., has opened a shop at 143 Bennett St., that city. The company organized recently by the election of the following officers, who are also the directors: Fred H. Merwin, president and treasurer; N. A. Walsh, vice-president; Edna W. Merwin, secretary.

The Lomar Manufacturing Co., Middletown, Ohio, manufacturers of shock absorbers, has been incorporated with a capital stock of $100,000. Officers are: C. W. Shartle, Jr., president and general manager; Thomas Randolph, vice-president; L. L. Lomar, general superintendent.

The Murphy Valve Co., Columbus, Ohio, which was recently incorporated for $50,000, has elected Paul R. Good as president; Harry B. Redding, vice-president; Walter S. Jones, secretary; was William G. Jones, treasurer.

At the annual meeting of the stockholders of the Superior Sheet Steel Co., Canton, Ohio, the following officers were elected: W. W. Irwin, president; H. A. Roemer, vice-president and general manager; H. S. Renkert, treasurer; D. A. Williams, assistant general manager; M. C. Summers, general manager of sales; P. I. Howenstine, assistant treasurer; U. K. Becker, secretary.

Announcement has been made that the Blake Pump and Condenser Co., of Fitchburg, Mass., will locate in Alliance, Ohio, and perparations are now under way to move the machinery to that city. In the new location the concern will be known as the Alliance Pumping and Machinery Co.

The Ketchum Tool Equipment Co., L. Leroy Ketchum, president, 856 Broad St., Bridgeport, Conn., tool manufacturers, has recently filed a petition in bankruptcy in the United States District Court.

The Acme Machine Co., of Hartford, Conn., has filed a petition in bankruptcy in the United States District Court, giving liabilities of $67,151, and assets of $20,467.50.

The Wagner Electric Manufacturing Co., of St. Louis, Mo., announces the removal of its Salt Lake City office to 313 Dooly Building.

Personals

EARL CONSTANTINE, executive secretary of the National Industrial Council, has been appointed assistant to John E. Edgerton, president of the National Association of Manufacturers. He will be located at the headquarters of the association at 50 Church St., New York City.

FRANK HIGGINS, works manager of the Willys-Morrow plant in Elmira, N. Y., has left that position to engage in business for himself.

TOBIAS DANTZIG has resigned as research engineer of SKF Industries, Inc. He will engage in scientific and technical consulting work specializing in bearing problems.

O. H. DALLMAN, formerly of the Vanadium Alloy Steel Co., has joined the sales force of the Independent Pneumatic Tool Co., of Chicago. Mr. Dallman will travel out of the general offices in Chicago.

GEORGE W. WAY has joined the Detroit sales force of the Union Drawn Steel Co., of Beaver Falls, Pa. For several years he has been a specialty salesman for the Carnegie Steel Co. in the Michigan territory, leaving there to become general sales manager of the Cromwell Steel Co., of Cleveland. For the past year he has been in charge of sales in the Middle West for the Electric Alloy Steel Co. of Youngstown.

JOHN A. PEEBLES, general foreman of the Willys-Morrow plant in Elmira, N. Y., has resigned.

HENRY ROSS JONES, formerly president of the United Alloy Steel Corporation, of Canton, Ohio, has been elected chairman of board of directors of the fifteen million dollar Dominion Alloy Steel Co.

F. W. MURPHY has resigned as head of the highway products department of the Truscon Steel Co., Youngstown, Ohio. He has joined the sales force of the J. Ira Davey Co., of Detroit.

EDWARD T. MCNULTY has resigned as superintendent of the Yorkville, Ohio, plant of the Wheeling Steel Corporation to become general manager of the Charcoal Iron Products Co., at Washington, Pa.

GORHAM C. PARKER has organized the Parker Arbor Co., Ann Arbor, Mich., for the manufacture of the Parker drill chuck arbors.

EDWIN P. HOPFER, purchasing agent of the Hartford Specialty Machine Co., Hartford, Mass., has been appointed a member of the City Planning Commission of Hartford.

W. J. SMITH has been appointed special sales representative for Ohio and Michigan for the Hill & Griffith Co. of Cincinnati, Ohio.

A. H. BENNELL has resigned from the sales staff of the Youngstown Sheet and Tube Co., of Youngstown, Ohio.

F. N. SATTER has resigned as chief inspector with the Newton Steel Co., Newton Falls and Youngstown, Ohio, to become district sales manager of the Electric Alloy Steel Co., of Youngstown.

Obituary

A. W. GIBBS, chief mechanical engineer of the Pennsylvania Railroad system, died suddenly on May 19. He was 66 years old. He served as an apprentice in the Altoona, Pa., shops of the company in 1879.

WILLIAM YEATES, founder of the London Machine Tool Co., died last week at his home in London, Ont., Canada, following an illness extending over many months. He was 75 years old.

ISAAC JOSEPH, president of the Isaac Joseph Co., iron dealers, and of the Edna Brass Manufacturing Co., of Cincinnati, Ohio, died suddenly at his home in that city on May 23.

F. J. TOWN, superintendent of the foundry of the Pittsburgh Valve and Fitting Co., Pittsburgh, Pa., died at his home in Barberton, Ohio, on May 24. He was 69 years old.

Forthcoming Meetings

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

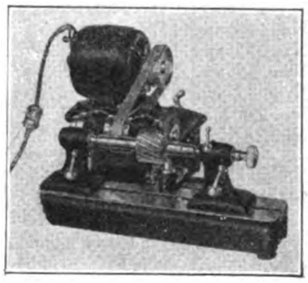
American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

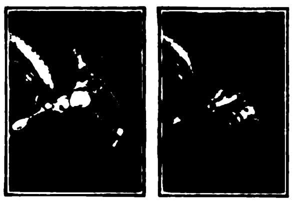
Grinding Machine, Cutter, Portable, Bench, "Elteco"
Liberty Tool Co., 1080 Springfield Ave., Irvington, N. J.
"American Machinist," February 9, 1922

The motor of ⅛-hp. capacity can be driven by either direct or alternating current, and is mounted on a slide to adjust the tension of the wheel-spindle belt. The wheel head has a transverse movement of 4 in., obtained by a crank-operated screw. Straight grinding work is mounted on centers with a swing of 7 in. The maximum distance between the centers is 9 in. For grinding cutters with angles or tapers, an attachment is provided with a longitudinal movement of 1⅜ in. for feeding the work, the feed screw being operated by a crank.



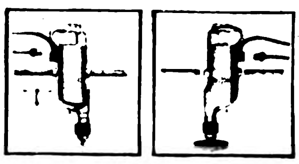
Stop, Cross-Slide, Lathe
Worcester Lathe Co., Worcester, Mass.
"American Machinist," February 9, 1922

A pinion keyed to the cross-feed screw is at all times in mesh with a gear which turns freely on a stud set into the back of the case. In adjacent faces of the gear and worm wheel are stop pins. The pins stop the rotation of the gear and worm wheel at a pre-determined point. The 0.001-in. graduations on the dial are spaced ⅛ in. apart, for close adjustment. The stop is imposed against the rotation of the screw, instead of against the forward movement of the slide. The slide may be run forward or back, and returned by turning the lever to re-engage the stop pins.



Drill and Grinder, Electric, Portable, Combination
Wodack Electric Tool Corporation, 23 South Jefferson St., Chicago, Ill.
"American Machinist," February 16, 1922

The tool has a drilling capacity of ⅛ to ⅜ in. in steel, and when used as a grinder carries a 6 x ⅜ in. abrasive wheel. Two speeds are provided, the slow one for drilling, the fast one for grinding. The tool can be quickly changed from high to low speed and from grinding to drilling. The motor develops ⅛ hp. and is universal, for direct and alternating current with the same voltage. The switch, of the automatic-stop type, is located in the handle top. Weight, 19 lb.



Jack, Automobile, "Hi-Lift"
Weaver Manufacturing Co., Springfield, Ill.
"American Machinist," February 16, 1922

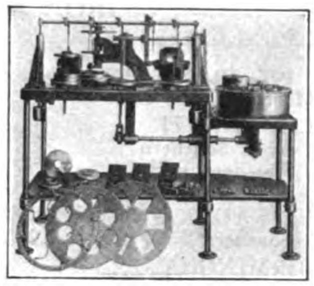
The jack is used in garages for lifting trucks and passenger cars, and enables the operator to raise one end of the chassis for working on the under parts of automobiles. The jack is mounted on four casters, the two near the operating lever having ball and roller bearings. The arm can be raised or lowered, by means of a ratchet and worm operated by a long lever. For raising and carrying truck wheels, an attachment can be fastened to the end of the arm. Saddle height, 7 to 38 in.; with screw attachment, 45 in. Lifting capacity, 3,000 lb. Width, 40 in. Weight, 225 pounds.

Prestometer, Fluid Gage, Piston-Ring
Coats Machine Tool Co., Inc., New York, N. Y.
"American Machinist," February 9, 1922

This device for gaging piston ring thickness consists of the prestometer fluid micrometer gage fitted to a special base. It has collapsible legs, and wing back stops to set the work. The base has two slots, extending radially at 60 deg. to each other from the point of contact of the measuring ball, to hold the adjustable contact points in position. It accommodates rings of any diameter up to 5 in. The piston ring rests on the two movable contact points and on the stationary one directly under the ball of the prestometer, giving a three-point support.

Finishing Machine, Air-Brake Valve, Semi-Automatic
Walter H. Foster Co., 50 Church St., New York, N. Y.
"American Machinist," February 16, 1922

The machine finishes mechanically both railroad air-brake slide valves and their seats, doing the lapping itself and maintaining flat surfaces to the edges of the ports and openings. The lapping plate and the work holder rotate in opposite directions, and are eccentric to each other. Thus, the work constantly changes its position on the lapping plate, so as to obtain flat surfaces and to keep the lapping plate true. The reciprocating laps on the left finish the seats in the bodies of the valves. A ¾-hp. motor drives the machine, although tight and loose pulleys can be employed. Floor space, 64 x 28 in. Weight, 1,200 pounds.



Sawing Machine, Band, Metal-Cutting
Clark Tool Works, Inc., Belmont, N. Y.
"American Machinist," February 16, 1922

The features of the machine are the movable carriage, gravity feed, work-holding vise and motor drive. The two speeds are controlled by a handle on the outside of the box. The table is pivoted in the center. The saw guides are mounted on the table and swing with it. The movable carriage operating on the table is provided with a gravity feed controlled by changing the position of the weight on the lever. Stops are provided to adjust the travel. The removable work-holding vise holds the work at any angle to the saw. Capacity, 6 x 12 in. Table, 20 x 24 in.

Marking Machine, Pantograph
George W. Dover, Inc., Providence, R. I.
"American Machinist," February 23, 1922

The machine is used for marking in multiple with diamond-pointed tools. The design or pattern is placed on the table at the front, and traced with the point connected to the pantograph motion operating the arm holding diamond-pointed tools. Thirty-four of these tools may be employed, and they cut both on the top and on the bottom of the work or roll. Lenses with trade marks invisible to the naked eye can also be marked. The top set of diamonds is rotated for this work by individual motors mounted on each spindle.

Clip, paste on 3 x 5-in. cards and file as desired

The Weekly Price Guide

Rise and Fall of Market

Advances.—Further upward movements in metals feature market, electrolytic copper quoted ½c. higher at New York; lead is now at 6.25c. higher than last week's price of 6c. Antimony is at 6.50c. Active demand has increased the price of copper sheets ½c. at New York, copper wire has advanced to 15c., and copper rods to 18.75c. Brass sheets and tubing rose from ¼ to ½c. Tin is firm. Zinc sheets are now quoted at 8.50c., advancing ½c. over last week's price. All scrap prices have advanced from ¼ to ¾c., heavy brass now quoted at 7c.

Declines.—Linseed oil fell to 91c. from 95c. because of lack of demand. Solder has dropped 2c., from 23 to 21c.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.52
Northern Basic	25.02
Southern Ohio No. 2	22.50
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.56
BIRMINGHAM	
No. 2 Foundry	17.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	26.36
Virginia No. 2	28.34
Basic	23.50@25.50
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	22.50@24.00
No. 2 Foundry, Southern, sil 2.25@2.75	24.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	24.16
Basic	25.00
Bessemer	26.96

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.5	5.0	3.0
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Denver	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.40	3.48	3.15	3.38
No. 12	2.45	3.53	3.20	3.43
No. 14	2.50	3.58	3.25	3.48
No. 16	2.70	3.68	3.35	3.58
Black				
Nos. 17 and 21.	3.00	4.15	3.55	4.10
Nos. 22 and 24.	3.05	4.20	3.60	4.15
Nos. 25 and 26.	3.10	4.25	3.65	4.20
No. 28	3.15	4.35	3.90	4.30
Galvanized steel sheets:				
Nos. 10 and 11.	3.15	4.35	3.75	4.30
Nos. 12 and 14.	3.25	4.45	3.85	4.40
Nos. 17 and 21.	3.55	4.75	4.15	4.70
Nos. 22 and 24.	3.70	4.90	4.45.	4.85
No. 26	3.85	5.05	4.60	5.00
No. 28	4.15	5.35	4.90	5.30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	8.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.81	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.70	4.66	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2.58	2.41	2.38
Soft steel bars (base)	2.48	2.31	2.28
Soft steel bar shapes (base)	2.48	2.31	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.58	2.41	2.38
Bar iron (2.00@2.10 at mill)	2.48	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/32	8.00		12@13
1/8	6.50		11@12
5/32 to 1/4	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.50
Tin, 5-ton lots, New York	32.25
Lead (up to carlots), St. Louis, 5.40; New York	6.25
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½@6.00

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	6.50	7.50	6.25
Copper sheets, base	20.25	20.00	23.00
Copper wire (carlots)	15.00	16.50	16.25
Copper rods (ton lots)	18.75	21.50	19.50
Copper tubing (100-lb. lots)	22.25	23.00	23.00
Brass sheets (100-lb. lots)	16.50	17.50	18.75
Brass tubing (100-lb. lots)	19.50	19.00	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.25	15.50	15.75
Brass wire (carlots)	17.00	17.75	.....
Zinc sheets (casks)	8.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....
Solder (½ and ½), (caselots)	21.00	22.00	19.00
Babbitt metal (fair grade)	35.00	40.75	36.00
Babbitt metal (commercial)	15.50	15.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	11.75	10.25
Copper, heavy, and wire	12.00	11.00	9.25
Copper, light, and bottoms	10.00	9.00	8.25
Lead, heavy	4.75	4.50	3.65
Lead, tea	4.25	3.25	3.00
Brass, heavy	7.00	5.00	8.00
Brass, light	6.00	4.50	4.75
No. 1 yellow brass turnings	6.50	5.50	5.00
Zinc	3.00	3.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

			New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:					
IC,	20x28,	112 sheets	20.00	18.25	18.50
IX,	20x28,	112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:					
IC,	20x28,	112 sheets	17.00	16.00	17.00
IX,	20x28,	112 sheets	20.00	18.75	19.60
Coke Plates, Bright					
Prime, 20x28 in.:					
100-lb.,		112 sheets	12.50	11.00	14.50
IC,		112 sheets	12.80	11.40	14.80
Terne Plate					
Small lots, 8-lb. Coating:					
100-lb.,	14x20		7.00	5.60	7.25
IC,	14x20		7.25	5.85	7.40

MISCELLANEOUS

		New York	Cleveland	Chicago
Cotton waste, white, per lb.		$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb.		.055@.09	.09	.09
Wiping cloths per M., 13½x13½		....	50.00	55.00
Wiping cloths per M., 13½x20½		....	55.00	65.00
Sal soda, 100 lb. lots		2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb.		2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots		.91	.95	1.04
White lead, dry or in oil	100 lb. kegs.		New York, 12.25	
Red lead, dry	100 lb. kegs.		New York, 12.25	
Red lead, in oil	100 lb. kegs.		New York, 13.75	
Fireclay, per 75 lb. bag			.80	1.00
Coke, prompt furnace, Connellsville... per net ton			$3.25@$3.50	
Coke, prompt foundry, Connellsville... per net ton			$4.25@$4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–10%	60–10%	60%
1½ and 1½x3 in. up to 12 in.	60%	60-10-10%	60-10%
With cold punched sq. nuts	40%	....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	....	$4.00 off
Button head bolts, with hex. nuts	30%	$3.90 net	.....
Hex. head and hex. nut bolts	35%	....	65-5%
Lag screws, coach screws	60–5%	....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	45%	60%	50-5%
Bolt ends, with hot pressed nuts	55%	....	55%
Tap bolts, hex. heads	+10–15%	....	.....
Semi-finished nuts ⅝ and larger	70%	75–5%	80%
Case-hardened nuts	65%	....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$5.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	5.00	3.50	3.50
Washers, round plate, per 100 lb. Off list	5.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.25	3.50	4.00
Rivets:			
Rivets, $\frac{7}{16}$ in. dia. and smaller	60-10%	70%	60-10%
Rivets, tinned	60-10%	70%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.70	$3.25	$3.00
Cone heads, ditto (net)	3.80	3.35	3.10
1¼ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	....	0.15
⅝ in. diameter *EXTRA*	0.15	....	0.15
½ in. diameter *EXTRA*	0.50	....	0.50
1 in. long, and shorter *EXTRA*	0.50	....	0.50
Longer than 5 in. *EXTRA*	0.25	....	0.25
Less than 200 lb. *EXTRA*	0.50	....	0.50
Countersunk heads *EXTRA*	0.35	......	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40 10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Ill., Chicago—Levitan Mfg. Co., 1335 Washington Blvd.—one hand screw machine with 1½ in. hole in spindle.

Kan., Hutchinson—The Modern Welding & Machine Shop, North Adams St., M. W. Hartman, Mgr.—heel cylinder grinding machine.

La., New Orleans—R. R. Hepinstall & Co., Maison Blanche Annex—12 ft. plate bending roll for ½ in. plate.

Mich., Battle Creek—Nichols & Shepard Co.—10 ft. power brake for 10 gage iron.

Mo., Carterville—Carterville Garage, 324 West Main St., R. Rice, Purch. Agt.—power drill press, lathe and emery wheel.

Mo., Carterville—W. Wilson, 120 East Main St., (garage)—power lathe, drill press and electric motor, 60 cycle.

Mo., Carthage—C. W. Biggs, (woodworking and machine shop)—lathe for power equipment.

Mo., Carthage—Carthage Press, H. K. Steward, Purch. Agt.—one power metal cutting machine and a power drill press.

Mo., Carthage—W. C. Hoots, 317 East 4th St., (woodworking shop)—wood lathe, band saw and polishing machinery for power equipment.

Mo., Joplin—Zark Dehydration Co., 1801 Main St., manufacturer of fruit dryers—power riveting machine for sheet metal.

Mo., Kansas City—H. C. Darnell Mchy. Co., 15th and Elmwood Sts.—power lathe, shaper and drill press.

N. Y., Beaver Falls—J. P. Lewis Co., (paper manufacturer), H. S. Lewis, Purch. Agt.—roll-grinding equipment.

N. Y., Brooklyn—U. S. Indestructible Gasket Co., 829 East 15th St.—one multiple four spindle movable drill head, to drill four holes $\frac{1}{16}$ to $\frac{1}{8}$ in. diameter, equally spaced on circles from about 3 to 6 in. diameter.

N. Y., Buffalo—A. Plotkin, 72-74 East Eagle St.—machinery and equipment for garage and repair shop.

N. Y., Niagara Falls—The McGarigle Machine Co., 518 2nd St.—cylinder grinding machine.

N. Y., Rochester—Morley Machine Corp., 800 St. Paul St.—lathes, punch presses and boiler tubes.

N. Y., Rochester—L. A. Royal, 4 Church St.—one 10 x 15 or 12 x 18 Platen press, (new or used).

N. Y., Rochester—C. Weber, Andrews St.—cylinder grinder and small machinery and tools for proposed garage on North Water St.

O., Cincinnati—The Eastern Mchy. Co., 408 East Pearl St., R. Smith, Purch. Agt.—power punch presses, all sizes, No. 18, 19, 20 and 21 Bliss; boring mills 30-72 in.; radial drills; 24 in. shaper; lathes 10, 12 and 14 in. swing; lathes 24-60 in. swing; hand screw machine.

O., Cincinnati—A. A. McLaughlin & Co., 24 West 2nd St., (dealers in woodworking machinery)—one Hawker No. 2 dowel machine; one Am. Columbia 42 in. and 48 in. triple drum sander; Smith or Greenlee hollow chisel mortiser; automatic lathe, 10 ft. between centers, 6 in. swing; Bates or Wysong & Miles, belt sander, (used).

O., Cincinnati—Norton-Broadway Mchy. Co., 236 Bway., (dealers in used machinery)—one 6 ft. radial drill press and one 36 in. shaper.

O., Cincinnati—The Randle Mchy. Co., Cincinnati, Hamilton & Dayton R.R., and Powers St.—60 in. vertical boring mill and power shear for 6 in. x 6 in. x ½ in. angles, (used).

O., Columbus — The Murphy Valve Co., Majestic Theatre Bldg., W. S. Jones, Secy.—one boring machine, one grinder, one drill press and other equipment.

O., Columbus—R. J. Rickenbocker, 183 East Cherry St., garage and repair shop—one grinder, one drill press and other equipment.

Pa., Sheffield—C. A. Dahl—machinery and equipment for garage and blacksmith shops now under construction.

Pa., Sheffield—M. A. Olson—cylinder grinding machine and other machinery for garage now under construction.

Va., Big Stone Gap—The Lonesome Pine Motor Co., (automobile repairs), A. P. Hammond, Secy.—various small tools in connection with machine shop.

Wis., Milwaukee—The Automotive Grinding Co., 118 Clinton St.—one Heald grinder No. 65.

H. T., Honolulu—The Honolulu Rapid Transit Co., Ltd., H. S. Johnson, Mgr.—$13,000 worth of machine and car shop equipment.

Ont., Ottawa—The City of Ottawa, City Hall, F. H. Plant, Mayor—cement gun, Universal tool and cutter grinder, power press, single head bolt machine, variety saw, quarry jack hammer, buzz planer and matcher, oil and gas furnace, and scleroscope.

Ont., Welland—The Lackawanna Tubes, Ltd., F. L. McCallum, Purch. Agt.—
One 18 x 10 lathe.
One 20 in. shaper.
One 36 in. planer.
One 20 in. drill press.
One 14 in. emery wheel and stand complete.
Blacksmith outfit.
One hydraulic pump 1,500 lb. pressure, 2,000 lb. max.
One air compressor 100 lb. pressure, and receiver for same.
One Gillitine billet shear for 4 in. max. round-inlet table 20 ft. long with gauges.

Machinery Wanted

Del., Wilmington—J. E. Marsden Glass Wks., Inc.—machinery and equipment for glass manufacturing plant.

Ga., Atlanta—The Atlanta Casket Co., Box 693, N. P. Cannon, Pres.—machinery and equipment for steel casket plant now under construction.

Ga., Cuthbert—Randolph County Advertising Club, J. G. Woodruff, County agt.—15-ton ice plant, complete.

Ky., Jackson—Jackson Lumber & Supply Co., W. C. Cole, Mgr.—machinery and equipment for lumber mill.

Ky., Lexington—American Metallic Packing Co.—225 cu.yd. daily capacity, jawed portable rock crusher on skids or wheels, (used).

Miss., Laurel—Chamber of Commerce, W. H. Smith, Secy.-Mgr.—complete machinery and equipment for canning plant.

Mo., Carterville — Carterville Weekly News, O. L. Whitestine, Purch. Agt.—job press and newspaper press for new plant.

Mo., Carthage—F. E. Ford, 313 East 4th St., (woodworking shop)—wood lathe, polishing machinery, and sanding machinery, for power equipment.

Mo., Carthage—G. W. Gibboth, 315 East 5th St., (blacksmith shop)—power drill press.

Mo., Kansas—Cavanal Coal Co. Ridge Bldg.—10-ton ice plant.

Mo., Kansas City—V. L. Phillips Co., 700 Delaware St., (contractor)—rock crusher, mounted outfit, but can use small jaw crusher on skids.

Mo., Webb City—Hilbum & Plain, F. Plain, Purch. Agt. — newspaper power printing press and job press.

N. Y., Batavia—E. N. Rowell Co., Inc.—additional machinery for the manufacture of paper boxes.

N. Y., Batavia—Ralph Gypsum Co. — crushing and screening machinery and equipment for mine.

N. Y., Buffalo—Amer. Macaroni Co., Inc., 825 Ferry St.—machinery and equipment for proposed macaroni factory.

N. Y., Buffalo—The Buffalo Coffee Co., Inc., c/o W. J. Daetsch, Ellicott Sq.—coffee roasting and packing machinery.

N. Y., Buffalo—Woodworking Mchy. Co. of Buffalo, 54 Mechanic St.—miscellaneous woodworking machinery.

N. Y., Jamestown—The New Ice & Coal Co., Gokey Bldg., J. H. Rogerson, Purch. Agt.—machinery for handling coal, wood, etc., and for the manufacture of ice.

N. Y., North Tonawanda—R. Wurlitzer Co., Inc., Niagara Falls Blvd.—machinery and equipment for the manufacture of toys.

N. Y., Rochester—M. Brennan, Frank St.—air compressor, pump and other equipment for proposed service station on Jones and Brown Sts.

N. C., Marion—The Clinchfield Pottery Wks., A. W. Hilton, owner—machinery for the manufacture of pots, vases and various earthenware articles.

O., Cleveland—Cleveland Metal Products Co.—machinery for the manufacture of oil stoves and utensils, for proposed plant at Oakland, Cal.

O., Cleveland—Nat. Bronze & Aluminum Fdry. Co., East 88th St. and Laisy Ave.—molding machines and miscellaneous foundry equipment.

Pa., Greenville—The Du Roth Steel Truck Co.—machinery for proposed truck factory.

Pa., Greenville—Greenville Steel Car Co.—one 10-ton crane.

Pa., Marianville—The Marianville Express, E. Pickens, Purch. Agt.—printing press, printshop equipment and small machinery to replace presses, etc., destroyed by fire.

Pa., Phila.—The Pennsylvania R.R., 18th and Filbert Sts., c/o Purchasing Dept.—6-15 ton electric cranes, 97 ft. span, for proposed addition to car shops at Altoona.

Pa., Pittsburgh—Bd. Educ., Fulton Bldg.—woodworking machinery for manual training departemnts of Westinghouse High School and Perrysville and Greenfield Elementary Schools, now under construction.

Pa., Republic—Redstone Twp. Bd. Educ., c/o A. Thompson, Republic—equipment for manual training dept. of high school in Redstone Twp., near Uniontown.

Pa., Titusville—E. Moore, 321 South Franklin St.—complete tinsmithers outfit and tools.

Pa., Titusville—Titusville Iron Wks. Co.—machinery and tools for proposed foundry on South Perry St.

S. D., Chamberlain—J. H. Olson & Co.—motor and mortise and tenon machine.

Tex., Austin—The Woodward Mfg. Co., Post Rd., S. Sparkes, Vice-Pres.—machinery for proposed auto body factory.

Va., Berkley (Norfolk P. O.) — The Huddleston Mahogany Co. Inc., c/o Greenleaf Johnson Lumber Co., S. Moore, Secy.—woodworking machinery.

Va., Gloucester—The Roaring Springs Marl Lime Co., R. M. Janney, Mgr.—several hoisting engines for plant, (new or used).

Va., Ocean View—The Normandie Corp., Willoughby Beach Blvd., bottling plant, C. A. Anderson, Secy.—bottling machinery for soft drink plant at Norfolk.

W. Va., Bluefield—Amicon Fruit Co., H. Charlton, Vice-Pres. and Genl. Mgr.—machinery for cold storage plant addition.

Wis., Fox Lake—F. N. Pettigrew—machinery for proposed truck factory at Waupun.

Wis., Milwaukee—H. Becker, 3407 Center St.—refrigeration machinery, motor power.

Wis., Milwaukee—C. Bielefeld, 1161 Grant St., carpenter and millwork—one sander.

Wis., Milwaukee—Maple Leaf Dairy Co., c/o W. G. Wheeler, 204 Grand Ave.—dairy plant equipment, line shaft drive.

Wis., Milwaukee—North American Textile Corp., c/o G. W. Kalinert, 1392 Prospect Ave.—looms, looping machines and electric motors.

Wis., Milwaukee—J. Weiss, 301 Reed St. —woodworking machinery to manufacture show cases, (exact requirements not determined).

Wis., Racine—The Wisconsin Gas & Electric Co., 305 6th St., S. B. Sherman, Purch. Agt.—one mono rail crane.

Wis., Riplinger—The Cheesemakers Mfg. Co., B. F. Riplinger, Purch. Agt.—modern cheese-making machinery, power.

Wis., Wisconsin Rapids—The Eighth Corner Cheese Factory, c/o A. Whitrock, Route 5—cheese making machinery, vats and boiler.

Mexico, Mexico City—The San Raefel Paper Co., Ltd.—machinery and equipment for proposed paper mill at Merida, Yucatan, Mex.

Ont., Burnt River—J. Hadley—equipment for shingle mill recently destroyed by fire.

Ont., Galt—Newlands & Co., Ainslie St. —weaving machines, etc. for robe and woolen mill addition.

Ont., Kitchener—Kitchener Mfg. Co., S. F. Howard, Mgr.—materials, tools and machinery for the manufacture of radio outfits.

Ont., Lynden—R. A. Thompson—$25,000 worth of equipment for flour mill.

Ont., Niagara Falls — The Canadian Shredded Wheat Co.—machinery for the manufacture of shredded wheat.

Ont., Toronto—B. Amod, 1216 St. Clair Ave.—gasoline pump and tank for garage.

Ont., Welland—British Empire Cutlery Corp., Ltd., C. Grantham, Purch. Agt.—machinery for the manufacture of scissors.

Ont., Welland—The St. Thomas Packing Co., W. Moody, Mgr.—complete equipment for cold storage plant.

Metal Working Shops

Cal., Colma—M. Massaglia has awarded the contract for the construction of a 1 story machine shop, on San Bruno Ave. Estimated cost $10,550.

Cal., San Francisco—E. T. Meakin, c/o Powers & Ahnden, Archts., 460 Montgomery St., is having plans prepared for the construction of a machine shop on Folsom and 14th Sts. Estimated cost $20,000.

Cal., Vallejo—Western Die Casting Co., 2927 Newbury St., Berkeley, is receiving bids for the construction of a 1 story 125 x 162 ft. factory on Napa St., here. C. E. Perry, Jr., 514 Marin St., Archt.

Conn., Springdale—The Segal Metal Products Co. has awarded the contract for the construction of a 1 story 40 x 45 ft. foundry extension, and a 3 story 30 x 120 ft. machine shop.

Ill., Chicago—R. F. France, Archt., 155 North Clark St., is receiving bids for the construction of a 1 story, 110 x 200 ft. garage at 247-78 North Clark St., for K. R. Beak Co., 193 North Clark St. Estimated cost $40,000.

Ill., Chicago—The Fries-Malwitz Motor Co., 4001 Irving Park Blvd., is having plans prepared for the construction of a 2 story, 122 x 217 ft. auto sales and service building on Irving Park Blvd. near Keeler Ave. Estimated cost $300,000. J. Jensen, 4915 North Lawndale Ave., Archt.

Ill., Chicago—The Holton-Seeley Co., 140 South Dearborn St., is receiving bids for the construction of a 2 story, 125 x 161 ft. garage at 616-24 Dewey Pl. Estimated cost $50,000. L. E. Russell, 25 North Dearborn St., Archt.

Mass., Cambridge—The Simplex Wire & Cable Co. has awarded the contract for the construction of an addition to its factory. Estimated cost $100,000.

Neb., Lincoln—F. W. Tyler, 827 "N" St., plans to build a 1 story, 50 x 50 ft. shop for plumbing and heating machine work. Estimated cost $8,000.

N. Y., Binghamton—Titchener Iron Wks., Inc., plans to construct additions to its plant at 7 Frederick St. Estimated cost between $35,000 and $40,000. L. E. Barnes, Secy.

N. Y., Buffalo—The Buffalo General Electric Co., 960 Front St., plans to construct 120 x 120 ft. service building 45 ft. high, on Front St. Estimated cost $135,000. Architect not announced.

N. Y., Buffalo—Fedders Mfg. Co., Inc., 57 Tonawanda St., manufacturer of auto radiators, plans to build a specialty factory addition to its plant. Estimated cost $5,500.

N. Y., Buffalo—J. Emig & Son, 871 East Ferry St., manufacturer of special machine tools, dies, etc., has awarded the contract for the construction of a 1 story, 50 x 80 ft. machine shop. Estimated cost $5,000.

N. Y., Buffalo—L. Reimann, 69 North Division St., plans to build a machine shop addition. Estimated cost $5,000. Architect not announced.

N. Y., Buffalo—E. M. Statler Co. plans to build a 6 story garage on Delaware Ave. and Mohawk St. Estimated cost $300,000 to $350,000.

N. Y., Geneva—De Zeng Standard Co., East State and 20th St., Camden, N. J., plans to build a factory for the manufacture of optical instruments, on East Main St., here. Estimated cost between $40,000 and $50,000.

N. Y., Hammondsport—The Keuka Industries Inc., plans to rebuild part of machine shop recently destroyed by fire. Estimated cost between $20,000 and $25,000. J. H. McNamara, Genl. Mgr.

N. Y., North Tonawanda—The Frontier Mfg. Co. plans to rebuild portion of kettle factory on Erie Ave., which was destroyed by fire. Estimated cost $20,000. Architect not announced.

O., Warren—The Youngstown Steel Co., Stambaugh Bldg., Youngstown, plans to build a large steel plant at Gibbons Farm, off North Mahoning Ave., here. Estimated cost $100,000 to $150,000. Architect not announced.

Pa., Bellefonte—Western Penitentiary of Pennsylvania, is having plans prepared for the construction of a 1 story, 30 x 132 ft. machine shop at Rockview. J. Frances, Warden. Private plans.

Pa., Greenville—The Du Roth Steel Truck Co. is receiving bids for the construction of a steel truck factory on Osgood St. Estimated cost $50,000. Architect not announced.

Pa., Newton Falls—The Newton Steel Co. is having plans prepared for the construction of 6 new sheet mills. $750,000. Architect not announced.

Tex., Austin—The Woodward Mfg. Co., Post Rd., manufacturer of auto bodies, plans to rebuild its plant which was destroyed by tornado. Estimated cost $200,000. S. Sparks, Vice-Pres.

Wis., Mellon—Universal Toy & Novelty Mfg. Co. plans to build a 1 story 100 x 152 ft. factory. Estimated cost $40,000. J. R. and E. J. Law, Strand Theatre Bldg., Madison, Archts.

Wis., Waupun—F. N. Pettigrew, Fox Lake, plans to build a 2 story, 70 x 120 factory here, for the manufacture of trucks. Estimated cost $60,000. Architect not selected.

Ont., Toronto—B. Amode, 1216 St. Clair Ave., has awarded the contract for the construction of a 1 story 50 x 60 ft. garage on Yonge St. Estimated cost $15,000.

General Manufacturing

Cal., San Francisco—California Woodcarving Co., 144 8th St., has awarded the contract for the construction of a 2 story, 27 x 100 ft. wood carving shop on Southeast Howard and Langton Sts. Estimated cost $15,000. Private plans.

Cal., San Francisco—The Italian-Amer. Cigar Co., 419 Jackson St., is having plans prepared for the construction of a 4 story factory on Vallejo and Battery Sts. Estimated cost $160,000. I. Zanolini, 604 Montgomery St., Archt.

Conn., Hanover—The Airlie Mills has awarded the contract for the construction of a 2 story, 60 x 230 ft. addition, for the manufacture of woolen goods. Estimated cost $85,000.

Conn., Hartford—The Capitol City Glass Co., Chapel St., has awarded the contract for the construction of a 2 story, 40 x 150 ft. addition to its glass factory. Estimated cost $40,000.

Ky., Jackson—Jackson Lumber & Supply Co., plans to build a lumber mill to replace the one destroyed by fire. Estimated cost $130,000. W. C. Cole, Mgr.

Ky., Lexington—The Co-operative Dairy Co. plans to construct a dairy on Jefferson St. $11,000. Architect not announced.

Me., Lewiston—Bates Mfg. Co. plans to build an addition to its mill for the manufacture of gingham goods. Architect not announced.

Mass., Springfield — The Springfield Catholic Diocese, Elliott St., has awarded the contract for the construction of a 1 story 40 x 180 ft. laundry on Wilbraham Rd. Estimated cost $40,000.

Mich., Kalamazoo—The Kalamazoo Vegetable Parchment Co., River Bd., is having plans prepared for the construction of a 4 story addition to its paper mill. Estimated cost $500,000. Billingham & Cobb, Press Blk., Archts.

Mich., Sault Ste. Marie — The Cadillac Lumber & Chemical Co., is having plans prepared for the construction of a 1 story, 93 x 275 and 110 x 110 ft., saw mill. Estimated cost $250,000. E. C. Hall, 221 Grand Ave., Milwaukee, Wis., Archt.

Minn., South St. Paul—R. N. Katz Packing Co., 352 East 6th St., St. Paul, is having plans prepared for the construction of a 3 story, 50 x 130 ft. packing plant, and a 1 story, 34 x 36 ft. office building. Estimated cost $100,000. Henschien & McLaren, 37 West Van Buren St., Chicago, Archts.

Minn., Winona—The Pepin Packing Co. is having plans prepared for the construction of a 1 story, 72 x 180 ft. canning factory and storage warehouse. Estimated cost $50,000. A. H. Husemann, 614 9th Ave., W., Archt.

Mo., Kansas City—F. C. Sharon, Sterling Bldg., will soon award the contract for the construction of a 1 story, 50 x 150 ft. factory for the manufacture of cartridges, on the northeast corner of Belmont and Independence Sts. Private plans.

N. J., Nutley—G. La Monte & Sons Co. Kingsland Rd., has awarded the contract for the construction of a 1 story, 60 x 100 ft. paper factory and a 2 story, 60 x 80 ft. office building. Estimated cost, $60,000.

N. Y., Batavia—K. B. Mathes, c/o Uni-Lak Co., manufacturer of paint specialties, plans to build a 1 story factory on South Lyon St. Estimated cost $25,000. Architect not announced.

N. Y., Buffalo—Amer. Macaroni Co., Inc., 825 Ferry St., plans to build a factory for the manufacture of macaroni. Estimated cost $5,200.

N. Y., Buffalo—Queen City Candy Co., Inc., 396 Bway., plans to build a 22 x 76 ft. candy factory addition, 26 ft. high. Estimated cost, $5,000. Architect not announced.

N. Y., Newark—Phillips-Werth Optical Co., Rochester, is receiving bids for the construction of a 55 x 175 ft. optical factory on Willow Ave. and West Main St., here. Private plans.

N. Y., New York—The New York Times, Times Sq., will soon receive bids for the construction of an 11 story, 100 x 143 ft. printing plant and office building at 217 West 43rd St. Ludlow & Peabody, 101 Park Ave., Archts. Noted Jan. 19.

N. Y., New York—The Transit Commission, 49 Lafayette St., will receive bids until June 5, for the construction of additional shops at Lenox Ave. and 148th St. Private plans.

N. Y., Port Henry—The Witherbee-Sherman Co. have had plans prepared for the construction of extensive additions to present plant facilities, including new blast furnace, daily capacity 500 ton, and new sintering plant capacity 400 tons, etc.

N. Y., Rochester—The Duntile Products Co., Holland, Mich., plans to construct tile manufacturing plant on Lexington Ave., here. Estimated cost between $40,000 and $50,000.

N. Y., Rochester—The Rochester Gas & Electric Corp., Clinton Ave, N., plans to

construct and install a new liquid gas pumping station.. Estimated cost $70,000. J. R. Haltenknapp, Engr.

N. Y., Utica—The McLoughlin Textile Corp., plans to build a factory and warehouse at 614 Broad St. Estimated cost $40,000 to $50,000.

N. Y., Watertown—The International Burr Corp., 500 Newell St., plans to construct a factory for the manufacture of pulp stone dressing burrs. Estimated cost between $20,000 and 25,000. Adress W. P. Aiken, c/o owner.

N. Y., Waverly—The Philadelphia Battery Co. is having plans prepared for the construction of a 3 story, battery manufacturing, charging, repairing and storage plant on Fulton. Estimated cost between $40,000 and $45,000. C. W. Smith, Waverly, Archt.

N. C., Goldsboro—The Utility Mfg. Co. plans to rebuild its veneering plant which was recently destroyed by fire. Estimated loss $200,000. Architect not selected.

N. C., Mt. Pleasant—A. M. Haithcock is having plans prepared to construct a flour mill. Estimated cost, $10,000 to $12,000.

N. C., Shelby—A. P. Weathers, et. al., plan to construct a cold storage plant. Estimated cost, including machinery and equipment, $40,000. Architect not selected.

O., Canton—The Hygienic Products Co., 715 Walnut Ave., S. E., has had plans prepared for the construction of a 2 story, 50 x 70 ft. factory for the manufacture of cleasing powder. Lockwood, Greene & Co., Hanna Bldg., Cleveland, Archts.

O., Cleveland—A. and B. Box Co., 8628 Woodland Ave., has awarded the contract for the construction of a 1 story, 90 x 193 ft. factory, at 1190 East 152nd St. Estimated cost $60,000. H. C. Roberts, Secy.

O., Cleveland—Billings-Chapin Co., 1163 East 40th St., is receiving bids for the construction of a 4 story, 80 x 140 ft. factory, for the manufacture of paints, on East 40th St. along the tracks of the New York Central R.R. Estimated cost $200,000. Lockwood Green & Co., Hanna Bldg., Archts.

O., Cleveland—Kaase Co., 2836 Lorain Ave., plans to build a 2 story 150 x 200 ft. addition to its bakery. Estimated cost $100,000. C. Kaase, Pres. W. D. Guion, 640 Engineers Bldg., Archt.

O., Cleveland—The Standard Envelope Co., 1011 Oregon Ave., is having plans prepared for the construction of a 1 story factory. Estimated cost $60,000. Christian, Schwartzenberg & Gaede, 1900 Euclid Ave., Archts.

O., Cleveland—H. M. White Music Co., 5229 Superior Ave., has awarded the contract for the construction of a 3 story 30 x 115 ft. factory on East 53rd St. and Superior Ave. Estimated cost $50,000. H. M. White, Pres.

O., Wellsville—The McNicol-Corns Pottery Co. plans to rebuild part of its pottery plant recently destroyed by fire. Estimated cost $8,500.

Pa., Altoona—The Confederated Home Abbatoir Corp., 216 Commerce Bldg., will receive bids until May 29, for the construction of 4 story, 81 x 163 ft. meat packing plant, 2 story, 47 x 57 ft. stock pens and 40 x 60 ft. power plant, on Sugar Run Rd. Estimated cost $125,000. Gorman-Brown Eng. Co., Boston, Mass., Archts. C. Stadler, 49 Rector St., New York, Engr. Noted Feb. 9.

Pa., Lewistown—The Viscose Co., Marcus Hook, manufacturer of artificial silk, has awarded the contract for the construction of 1 story manufacturing buildings, here. Estimated cost $1,500,000.

Pa., Marianville—The Marianville Glass Mfg. Co. plans to rebuild its plant which was recently destroyed by fire. Estimated cost $55,000. Architect not announced.

Pa., Phila.—W. E. S. Dyer, Engr., Land Title Bldg., is receiving bids for the construction of a 5 story, 61 x 64 ft. plush factory on Venice St. and Green Lane, for the Kaufman Plush Co. Estimated cost $80,000.

Pa., Phila.—G. W. Lindsay, 5120 Wakefield St., has awarded the contract for the construction of a 2 story, 40 x 100 ft. machine shop addition at 5116 Wakefield St.

Pa., Phila.—The Quaker City Laundry, 48th and Ludlow Sts., has awarded the contract for the construction of a 2 story, 16 x 32 ft. laundry on 48th and Ludlow Sts. Estimated cost $85,000.

Pa., Wissinoming (Phila. P. O.)—C. Wunder, Archt., 1415 Locust St., Phila., is receiving bids for the construction of 2 story, 35 x 50 ft. and 1 story, 48 x 234 ft. factory for the Natl. Ammonia Co., Van Kirk Ave., Phila. Estimated cost $50,000.

R. I., Olneyville — The Rochambeau Worsted Co. has awarded the contract for the construction of a 3 story, 100 x 300 ft. factory for the manufacture of worsted goods. Estimated cost $250,000.

Vt., Brattleboro—The Preshey-Leeland Co., Barre, plans to construct granite cutting plant. Estimated cost $100,000. Architect not announced.

Va., Richmond—Virginia Carolina Rubber Co., 10 North 19th St., plans to build a 1 story, 100 x 271 ft. factory on Mill Rd. along the tracks of the Southern R.R. Estimated cost $25,000. Davis Bros., 2510 West Main St., Archts.

Va., West Point—Chesapeake Corp. of West Point, plans to build a mill for the manufacture of pulp board and paper specialties. Estimated cost $200,000 to $250,000. W. C. Gouldman, Secy. Architect not selected.

W. Va., Bluefield—Amer. Fruit Co. plans to build a 6 story cold storage plant addition. Estimated cost including machinery, etc., $250,000. H. Charlton, Vice Pres. and Genl. Mgr. Architect not announced.

Wis., Madison—Kennedy Dairy Co., 618 University Ave., will soon award the contract for the construction of a 2 story, 85 x 132 ft. dairy. Estimated cost $80,000. E. Tough, 24 East Mifflin St., Archt.

Wis., Madison—The Natl. Vacuum Street Sweeper Co., c/o D. Mowry, Secy. Assn. of Commerce, Cantwell Bldg., plans to construct a 4 story, 60 x 120 ft. factory. Estimated cost $60,000. Architect not selected.

Wis., Madison—M. P. Schneider, Archt., 401 West Doty St., is receiving bids for the construction of a 1 story, 50 x 110 ft., filling station on Gilman St., here, for North Wisconsin Oil Co., Menasha. Estimated cost $45,000.

Wis., Monroe—The Badger Cheese Co. has awarded the contract for the construction of a 2 story, 26 x 100 ft., cold storage plant. Estimated cost $25,000.

Wis., Prairie du Chien—The Prairie du Chien Woolen Mill Co., has awarded the contract for the construction of a 3 story 47 x 186 ft. factory addition. Estimated cost $65,000.

Wis., Pulaski—The Badger Cabinet Co., Plymouth, plans to construct a 2 story, 50 x 100 ft., furniture factory. Estimated cost $55,000. Architect not selected.

Wis., Racine—S. C. Johnson & Son Co., 1012 16th St., manufacturer of floors, etc., has awarded the contract for the construction of a 3 story, 60 x 162 ft. factory on 15th St. Estimated cost $70,000.

Wis., Spencer—The Spencer Condensory Co. has awarded the contract for the construction of a 2 story, 48 x 96 ft. condensory. Estimated cost $30,000. Noted March 2.

Ont., Burnt River—J. Hadley plans to rebuild shingle mill recently destroyed by fire. Estimated cost $35,000.

Ont., Galt—Newlands & Co., Ainslie St., will soon award the contract for the construction of a 3 story, 86 x 86 ft. factory addition for the manufacture of robes and woolens. Estimated cost $50,000. Address G. Dobbie.

Ont., Niagara Falls — The Canadian Shredded Wheat Co. has awarded the contract for the construction of a storage building, containing a cleaning department, etc., on Lewis Ave. Estimated cost $150,000.

Ont., Welland—The Empire Cotton Co., Ltd., A. D. Payne, Secy.—machinery and equipment for new $250,000 addition to cotton mill here.

Ont., Windsor—The Shell Oil Co., 3608 Notre Dame St., E., Montreal, is having plans prepared for the construction of an oil distributing plant on Caron Ave., here. Estimated cost $100,000. Private plans.

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American Machinist

KENNETH H. CONDIT and FRED H. COLVIN, *Editors*
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Features of the Reo Apprentice System—Fred H. Colvin
Tool Engineering—Albert A. Dowd and Frank W. Curtis
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WHO'S WHO

MR. CHARLES HENRY MONFORT ATKINS

MR. C. H. M. ATKINS, banker and manufacturer, was born in Cincinnati, Ohio, in 1870, and was educated in the Cincinnati Public Schools and the Baldwin Private School.

He started his career as a successful financier as a bookkeeper with a coal company. From there he went into a similar position with his grandfather, who was owner of the Warner Elevator Company, and since then has been concerned with the ups and downs of the Warner Elevator Company. In 1906 Mr. Atkins became associated with the Cincinnati Planer Company, and this was his introduction to the machine tool business.

Mr. Atkins is now chairman of the board of the Cincinnati Planer Company, president of the Acme Machine Tool Company, president of the Greaves-Klusman Tool Company, president of the Warner Elevator Mfg. Company, president of the Sharpsburg Realty Company, president of the First National Bank of Norwood, director of the Fifth-Third National Bank of Cincinnati, the Brighton Bank & Trust Company, Cincinnati, and others. He has been president of the Business Men's Club, is vice-president of the Cincinnati Manufacturers' Club and is a member of a number of country clubs.

Mr. Atkins gets his chief pleasure from being boss of the Business Men's Club and from visiting with his friends. And he is a real friend—one who can be called on at all times.

He excels in bowling on the green and he can be classed with Dan O'Leary when it comes to walking.

American Machinist

Volume 56 NEW YORK, JUNE 8, 1922 Number 23

Scientific Management in the British Factory

Considered by Some a Revolutionary Movement—Why It Cannot Be Adopted as a Whole—Methods Not Popular with Organized Labor

BY WILLIAM J. HISCOX

THE call of scientific management has been responded to in a manner typically British, the result being that even now it is enjoying but a doubtful sort of popularity. While in some cases its need is being frankly recognized and efforts are being made to secure its enthronement, in others it is being looked upon as a revolutionary movement and as such to be avoided as the plague. Yet it is in the latter connection that progress is being made, for unwittingly, perhaps, its opponents are succumbing to its charms and improvements are being effected which, although not openly under the banner of scientific management, are at least indebted to it for the inspiration. The enthusiasts swallowed the doctrine wholesale, and failing to achieve results, condemned it. This because they did not understand. The others regarded it with suspicion but, recognizing its effect upon the production of America, commenced a progressive campaign which embodied its essentials.

> PLANT LAYOUT, types of shop buildings and the attitude of employees are all governing factors in the success of new systems.
>
> British manufacturers do not discredit scientific management, but do believe that the adoption of any system in toto as a panacea for all ills is fraught with great danger unless the remedy be administered in homeopathic doses.

So for the moment the popularity of scientific management is of a doubtful character, for its erstwhile champions now openly deride it and its opponents make use of its ideals without acknowledgment. But, when all is said, it is a principle rather than a system, and a principle may be subject to adoption without being destroyed. The seed has been planted and the tree will grow but the difference in the soil will naturally affect the appearance. In America it is a strong and mighty tree, of huge girth and of comprehensive embrace; but in England it is small and compact but none the less virile. It cannot be otherwise, for the conditions in the two countries are utterly dissimilar, and there is no room here for the giant growths of the States. That is why scientific management, as practiced in America, cannot be imported, and because those who have attempted to do so have failed, it does not mean that adoptions are impossible.

There are many here who have a wholesome respect for the business methods of America, and if these methods are accepted as proof of what can be done in given circumstances, appreciation will have a stimulating effect. But it is a mistake to assume that there are no brains in the Old Country, and that the future of industry depends upon the importation of methods from abroad. One industry has been built up by ideas inspired by the conditions we were called upon to meet, and at that time there were no precedents to act as a guide. Our American cousins had the precedent of our labors, and were thus able to avoid many pitfalls. They used our ideas as a means of effecting improvements, and they were thus enabled to commence upon a higher level than we had attained. Their own peculiar circumstances had to be catered to, and in their efforts to solve the problems new ideas and methods were evolved. While this development was taking place over the water, we at home were not standing still, but our development was of a somewhat different order. We were moving forward, but not so rapidly, because the circumstances were not so vital. The industrial position just prior to the World War made it necessary for us to increase our efforts, and naturally enough it was to America that we turned our eyes. We saw the methods by which she had surmounted difficulties and was forging ahead, and we were inclined to examine these methods with a view to adoption to our own needs.

The mistake was that many failed to do what the Americans had done previously, viz., to profit by the experiences of others and avoid pitfalls. The Americans started off with an American adoption of British ideas, specially designed to cater for her own peculiar requirements, and what is now wanted in this country is a British adoption of American ideas, specially designed to cater to its present-day requirements.

We should be able to lead off on a higher plane—that is to say, the methods we evolve should be more efficient when applied to British manufacture than are the present American methods in relation to their own manufacture. If a man invents something, all the other inventors seek to improve upon it, not to copy it. They use it as a spring board, and we must do the same with methods. No one man can draft out a system and say that it covers the beginning and the end of scientific management. It is at present only in a crude shape, full of possibilities, but as yet undeveloped. The seed may be cultivated in all countries and applied to all industries, but the methods employed will be dissimilar.

The measure of success attained depends upon the

efficiency of the method employed to deal with the specific problem. The monopoly is held by no one country or firm. It is purely a question of efficient application, and so long as the *principle* is thorougly understood, the *application* is a mere matter of detail as it automatically presents itself.

Some British firms boast of their Americanized systems, but they are wrong. The actual systems (in entirety) operating in America cannot be applied with success in any British factory. British foremen and department heads are sent to America to see the methods employed, and while this is all good, these British foremen could not apply those methods if they would. This is no reflection upon their personal ability, for no man, no matter how fortunate he may be in the matter of brains, could do it. But an examination of those methods would undoubtedly suggest an adoption, and it is for this reason that the foremen are sent.

Part Acceptance of Scientific Management

We have accepted scientific management, so far as it applies to sectional control. We have discarded the "all rounder" and are cultivating the "specialist," and in theory, we believe in payment by results. Unfortunately for us, many of our factories were built before the scientific era dawned and we have not advanced far enough to say "Scrap the lot, and let us rebuild." We do the best we can with the means at our disposal, and one of the reasons why our methods must rise superior is that greater skill is necessary to exploit the possibilities of our somewhat antediluvian style of factory.

Our attempts at "mass production" upon the American plan have failed, but our "repetition production" is going strong, because it fits in with the need. We have, of late years, given more attention to the organization of our toolroom, and we are coming round to the belief that this is a productive department in the truest sense of the term. The "aids to machining" are many and various, and "work by hand" is practically confined to assembling. The "fitter" of a decade ago, who could "turn his hand to anything" has disappeared, and in his place is the "specialized assembler" who handles his one little section so rapidly that the erstwhile "fitting department" is enlarged almost beyond recognition to allow for the units it is necessary to lay down at one time to permit of continuous employment.

We have realized that "mechanical aids" are necessary in the interests of rapid and economical production, and our machining departments are well equipped. The operations on each and every detail are calculated to a nicety, and the old "all embracing" process order is replaced by two or more orders of a more definite character.

We have a planning department, and output from every manufacturing section is pre-determined. We no longer expect the department foreman to calculate his times or rates—the expert rate fixer is available for the purpose. The works manager is not now expected to run the factory single-handed. He has the assistance of experts who between them control the factory organization. There is the works engineer, the production manager, the progress manager, the inspection manager, the commercial manager, and the like. Each is a specialist, with ability and opportunity of concentrating upon the one thing which immediately concerns him.

Cannot the principle of scientific management be discerned here? And yet this name is not mentioned in the factory. The methods adopted are dictated by common sense and a keen appreciation of the need of product. It is recognized that it must be produced to sell, which means that the cost incurred in manufacture must be low enough to permit of a margin of profit between that and the selling price, which must be low enough to attract the notice of the buyer.

We therefore endeavor to reduce costs by quickening output, for this is the only way to insure economical production. We have a factory and upon this we have to pay the standard rent, rates and taxes, no matter now much (or how little) is being produced. The power and lighting charges are not entirely standard, but increased production in the building already equipped with power and light does not materially increase these charges, and the same may be said in respect to the management and administration charges. It is the direct labor charge which alone shows any marked increase, and this again is quite disproportionate to the increase in production. It is not that the wages of the individual are reduced—rather they are increased—but the cost per piece is reduced. The man who produced one piece in one hour, at a labor cost of 2s. 1d. now turns out four pieces per hour, at a labor cost of 9d. each.

Our organized workers are not taking kindly to the idea of "payment by results" but individually they are rather keen upon it. At the present time the methods of times fixing are not so scientific as they might be, and until something is done in this direction there is sure to be some opposition. In spite of the progress already made, factory organization does not yet commend itself to the workers, and our methods of management must be further developed before the confidence of the workers is gained.

It is a question of thoroughly understanding the needs of industry and applying the correct remedies. Everything under the sun is good, so long as it is in its right place and kept there. We know that the methods of twenty years ago are inadequate today and we have to move with the times. Our population is increasing and employment must be found. We have to think of industry as something necessary to preserve the whole human race and not regard it as purely personal.

A Modified System

In England this is being appreciated but it is a slow process. We have, however, accepted the principle of scientific management and we are putting it into practice in our own inimitable way. We are not content to copy the American system, for that will not assist us, but we *are* out to improve upon it inasmuch as we must make it fit in with our own requirements.

Scientific management has not "had its day," as many people aver. In fact, so far as this country is concerned, its day is only just dawning. Before long the possibilities will become more apparent and exploitation will follow. It is thought by many that our manufacturers are too conservative to grasp at the opportunities offered and no doubt this is correct. Fortunately for the country, however, there is a band of business men who appreciate what business really is and who frankly enjoy their calling. They have no use for hoary traditions. neither do they possess conservative tendencies and sooner or later they will assume control and in the reconstruction which follows, scientific management will undoubtedly come into its own.

Standard Cams for Brown & Sharpe Automatic Screw Machines

Making Special Cams Unnecessary in Many Cases—Cams for Forming and Cutting Off Often Interchangeable—Marking and Indexing Cams

By D. A. NEVIN
Chief Engineer, Watters Corporation

IN ALL factories where the product includes screw-machine work there frequently arises the question of making special cams for parts required in considerable quantity but which are not to be manufactured permanently.

In presenting the standard cams, Figs. 1 to 5, it is not claimed by the writer that they will cover all varieties of plain and threaded parts, a few of which are suggested in Figs. 6 and 7; but it is the purpose to show how they may be made the foundation of a system in which each cam is detailed on a card and numbered so that after a required set of cams has been computed the nearest standards may be selected from the list and the expense of making special sets of cams thereby greatly reduced. As the number of cams increases, the system naturally becomes more complete and therefore of greater value. An order of operations (Figs. 9 and 10) is furnished the operator the same as when special cams are made. It specifies by symbol number the cams to be used, also the spindle speeds and gearing, and is an improvement over the old method of requiring the foreman or set-up man to piece together a set of cams, making a guess at the proper feeds and speeds.

This article refers to fast jobs on the No. 00 machine, though fast jobs on the No. 0 machine can also be handled economically by this method. For all work on the No. 2 machine it is advisable to make individual sets of cams. However each cam of these sets should be numbered and card indexed as there is always a possibility of using the cross-slide cams and sometimes the lead cam for other work.

The cams illustrated in Figs. 1 to 5 will make all of the parts shown in Figs. 6 and 7, with only a slight difference in production than if special cams were used.

When necessary to design special cams, all similar parts to be made should be grouped. For instance parts *H* and *K* (Fig. 7) can be made with the same cams, provided the cut-off cam is made to suit *H*; therefore it is well to make first those cams required to have the most throw. A slight difference in the length or lead of the thread does not necessitate a special thread lobe,

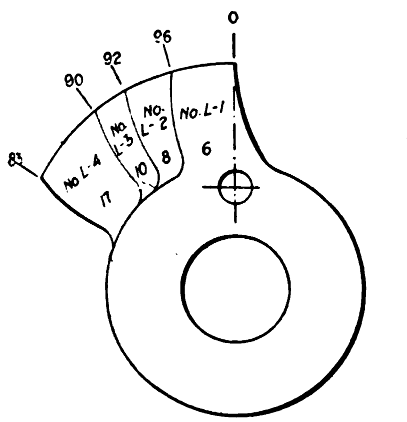
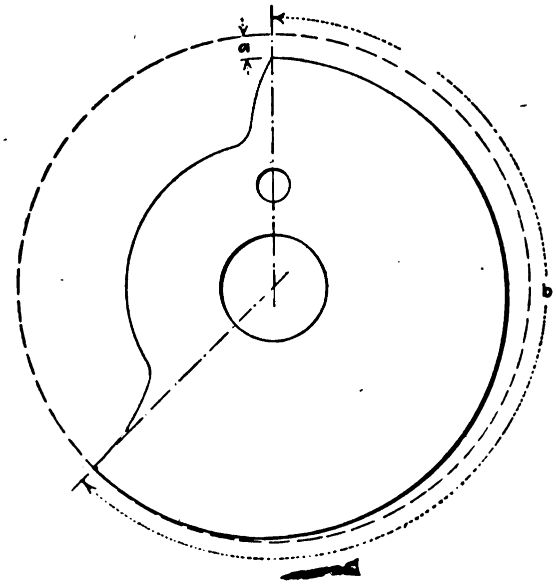


FIG. 1



Number	Throw	Hdts.
S-1	0.040	60
S-6	0.040	80
S-9	0.070	60
S-10	0.100	60
S-3	0.100	70
S-2	0.110	70
S-13	0.110	80

Number	Throw	Hdts.
S-11	0.120	60
S-12	0.140	60
S-4	0.160	85
S-7	0.175	60
S-5	0.175	70
S-8	0.175	90

FIG. 2

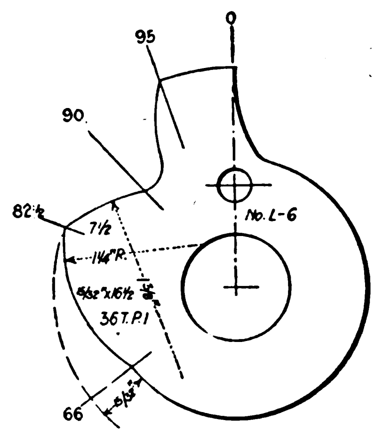


FIG. 4

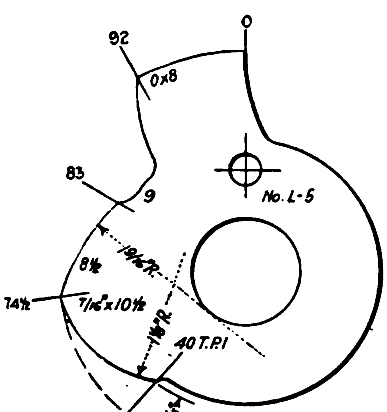


FIG. 3

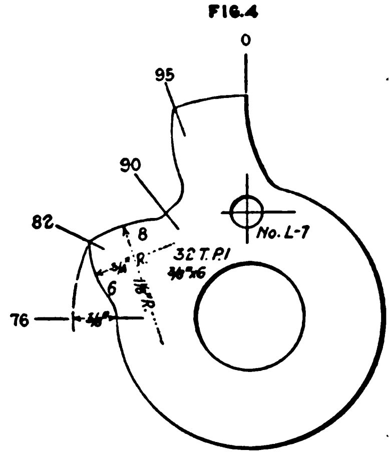


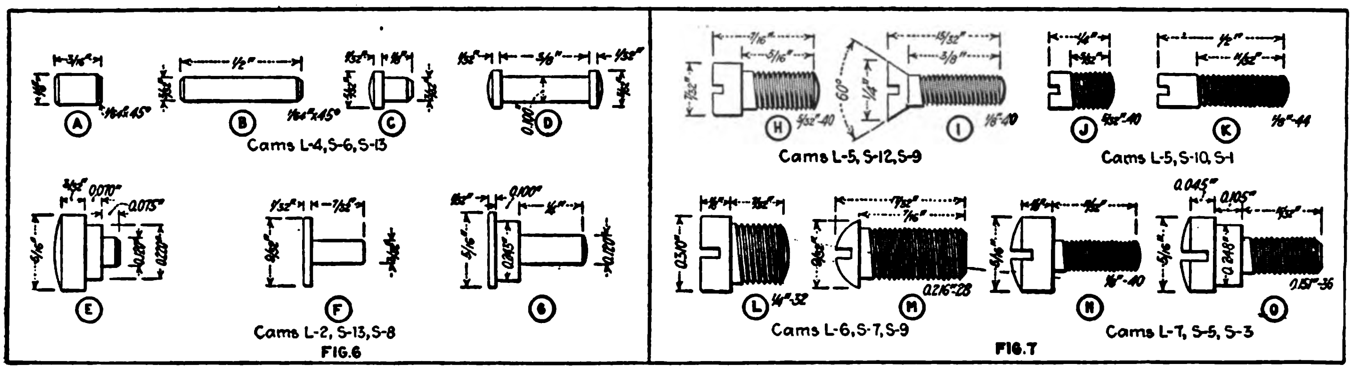
FIG. 5

FIGS. 1 TO 5. STANDARD CAMS

as the purpose of the thread lobe is to start the threading die and it is made with sufficient clearance to allow the die to thread itself on the work and to be threaded off again by the reversal of the spindle. The compression of the coil spring in the die holder makes allowance for considerable variation in the length of the threaded part.

As is generally known, cams used for forming and cutting off operations are interchangeable providing the throw and length of cam surface are suitable for the work to be done.

For forming operations the cross-slide cams can be used for a great variety of jobs, because this operation is usually performed on the end of the bar while the finished part is being cut-off, therefore a wide variance in the length of the cam surface has no effect on production and causes only a small variation in the feed of the form tool. The throw of form cams does not vary greatly because they have no relation to the diameter of the work, as for instance the screws *H* and *M* (Fig. 7), also parts *A*, *B*, *C* and *D* (Fig. 6), have practically the same difference in diameters and therefore require the same throw of form cam.



FIGS. 6 AND 7. PARTS THAT CAN BE MADE BY THE CAMS SHOWN IN FIGS. 1 TO 5

ORDER OF OPERATIONS	SPINDLE SPEED 1087 R.P.M.	HUNDREDTHS OF CAM SURFACE	CAM NUMBER
Feed stock to stop	11 Revs	7	
Cut off 0.175 inch travel at 0.00115 feed	152 "	93	
Form while cutting off 0.101 inch travel at 0.00066 inch feed	(152 ")	(93)	
Total revolutions to make one	163 "	100	
Time for one piece, 9 seconds. Gears: 60 driver, 54 driven			
Net in 10 hours, 3,600. Maximum surface speed of stock, 89 ft. per minute			

FIG. 8. PRELIMINARY LAYOUT FOR PARTS *E*, *F* AND *G* (FIG. 6) IF MADE FROM SCREW ROD

ORDER OF OPERATIONS	SPINDLE SPEED 927 FORD	SPINDLE SPEED 1273 BACK	HUNDREDTHS OF CAM SURFACE	CAM NUMBER
Feed stock to stop		15 Revs	8	
Cut off 0.140 inch travel at 0.0012 inch feed		114 "	60	S-12
Form while cutting off 0.070 inch travel at 0.0006 inch feed		(114 ")	(60)	S-9
Index turret 5 times, reverse spindle clearance		8	4	
Thread on 16 threads at slow speed	16	21	10½	S-5
Reverse spindle, thread off		16	8½	
Index turret		17	9	
Total revolutions to make one		191	100	
Time for one piece, 9 seconds. Gears: 60 driver, 54 driven				
Net in 10 hours, 3,600. Maximum surface speed of stock, 83 ft. per minute				
Maximum surface speed to thread, 30 ft. per minute				

FIG. 10. PRELIMINARY LAYOUT FOR PARTS *H* AND *I* (FIG. 7)

An order of operations similar to Fig. 8 should be worked out for each representative group and figured according to the proper feeds and speeds. Drawings and cams similar in throw and length of cam surface are given a standard symbol number. The throw and length of cam surface is stamped on each cam as shown in Figs. 1 to 5.

In Fig. 8 is shown an order of operations for parts *E*, *F* and *G*, Fig. 6, made from screw rod, the throw of the form cam being relative to the maximum and minimum diameters of the different parts and the throw of the cut-off cam relative to the largest diameter of all of the parts, adding 0.014 in. for the bevel and 0.005 in. for facing the end of the bar.

The cams required are lead cam with stop seven hundredths of cam surface, cut-off cam 0.175-in. throw by ninety-three hundredths, form cam 0.101-in. throw by ninety-three hundredths. Selecting from the standard cams we find a lead cam with stop lobe of eight hundredths, No. L-2, Fig. 1; cut-off cam 0.175-in. throw by ninety hundredths, No. S-8 and form cam 0.110-in. throw by seventy hundredths, No. S-2, Fig. 2. The lead cam is cut down sufficiently to allow for all but extra long parts. The rise and drop is made according to the templet for 6 to 35 sec. jobs. The pinhole is not required to be used on the No. 00 machine for driving purposes and by removing the pin, the cams

ORDER OF OPERATIONS	SPINDLE SPEED 1492 R.P.M.	HUNDREDTHS OF CAM SURFACE	CAM NUMBER
Feed stock to stop	14 Revs.	8	L-2
Cut off 0.175 inch travel at 0.00111 inch feed	157 "	90	S-8
Form while cutting off 0.110 inch travel at 0.00079 inch feed	(139 ")	(80)	S-13
Lost time	3 "	2	
Total revolutions to make one	174 "	100	
Time for one piece, 7 seconds. Gears: 60 driver, 42 driven			
Net in 10 hours, 4,600. Maximum surface speed of stock, 122 ft. per minute			

FIG. 9. PRELIMINARY LAYOUT FOR PARTS *E*, *F* AND *G* (FIG. 6) IF MADE FROM BRASS

SKELETON ORDER OF OPERATIONS	SPINDLE SPEED 192 FORD. & BACKWARD	HUNDREDTHS OF CAM SURFACE	CAM NUMBER
Feed stock to stop		5	
Cut off 0.175 inch throw		.	
Form 0.100 inch throw			
Clear		6	
Thread on 18 threads and reverse spindle	18	7	
Thread off 18 threads	18	7	
Index turret		5	
Total revolutions to make one	257	100	
Time for one piece, 20 seconds. Gears: 20 driver, 40 driven			
Net in 10 hours, 1,600			

FIG. 11. PRELIMINARY LAYOUT FOR PARTS *H* AND *O* (FIG. 7) IF MADE FROM HARD STEEL

may be located in any suitable radial position. However it is well to make it a rule when laying out to start all cross-slide cams at zero so that they may be the more interchangeable if locating pins are used.

A numerical list of all cams should be kept for the purpose of taking out new symbol numbers and each cam should be entered on an individual card so that it may be filed in order according to throw.

Parts can be made from brass or hard steel with the same cams, using suitable feeds and speeds, as for example the order of operations shown in Fig. 9 for the parts *E*, *F* and *G*, Fig. 6, if made from soft brass.

In designing lead cams to become standards for threaded parts, a variety of thread lobes (designed according to various speeds and pitches of threads) are laid out on transparent paper for comparison.

Usually the selection of a few varieties will answer most requirements. These are stamped with throw of cam, hundredths of cam surface, and pitch of thread for which the cam was designed, the latter for comparison when using the cam for making other screws. The cam shown in Fig. 3 was designed for use with a fast spindle speed backward and intermediate spindle speed forward, while the one shown in Fig. 4 was designed for a fast speed backward and slow speed forward and the one shown in Fig. 5 for the same speed forward and backward.

In order to select a suitable thread-lobe cam for making a screw it is necessary to find the proper gearing to rotate the cam at a speed corresponding to the required spindle speed. As an example, a $\frac{1}{8}$-in. 36 pitch screw, $\frac{11}{32}$ in. long with a $\frac{5}{16}$-in. diameter head made from hard steel would require surface speeds of approximately 25 ft. per min. for threading and 65 ft. per min. for forming and cutting off or a suitable spindle speed of 792 r.p.m. forward and backward.

In the skeleton order of operations (Fig. 11) it is shown that if the thread cam shown in Fig. 5 is used, the number of hundredths of cam surface for threading (or 7) divided into the eighteen revolutions required for threading, equals 257 revolutions of the spindle to make one piece. Referring to the table in the B. & S. instruction book for the No. 00 machine, under 792 r.p.m. we find the nearest number to 257 is 264, requiring gears 20 driver and 40 driven. If the required spindle speed was 927 r.p.m. gears 20 driver and 34 driven would be used with the same cam. The amount of cam surface not used (Fig. 5) approximately establishes the minimum feed for the cutting off and forming operations, but as a rule this does not interfere with the selection of the lead cam. In the example above the feed for cutting off and forming (also using standard cams) is 0.00086 in. and 0.0005 in. respectively. The omissions in Fig. 11 are to make clearer the method of computing to obtain proper gears.

If a thread lobe is laid out for the screw given in the above example the outline will be found to match closely with that in Fig. 5, designed for a different pitch screw made from soft steel with a correspondingly faster spindle speed.

Threaded and plain bushings, collars and parts requiring a variety of turret operations can also be made with a large percentage of standard cams, although those lead cams having more than two lobes in addition to the stop are usually limited to machining the work for which they were designed. Cross-slide cams having a small amount of cam surface occur frequently in this class of work and may be used for a great many different parts.

A few of the cams are used so frequently that it is advantageous to duplicate them. Parts to be made in large quantities should have special cams designed for the purpose of saving every fraction of a second, an economy which will become noticeable in a few weeks. The nature of the work, number of machines and cams on hand, etc., are all factors which determine to what extent the standard cams may be used.

Enlargement of Cast Iron by Heat-Treatment

By Guy L. Bunch

With reference to an editorial query appended to an article by Ivan C. Beach on the subject of "Enlarging Gas-Engine Pistons," appearing upon page 638 of *American Machinist*, my experience may be of interest.

While serving as assistant inspector in the Bureau of Ordnance, Navy Department, I made a series of experiments and found that a 12-in. cast-iron projectile was enlarged 0.017 in. at the bourrelet, while at the base of the same projectile the swelling amounted to 0.020 in. The test was made upon the body of a 12-in., 870-lb. standard Navy target projectile that had been cut off just forward of the bourrelet, and was for the purpose of determining whether or not it was possible to reclaim projectiles that had been machined below the limit of size for acceptance.

Three test bars were taken out of the projectile by means of a hollow drill and laid aside to be used to check by. Three others were taken out and heat-treated at the same time and in the same furnace with the mass, and still three more were taken out of the mass after it had been heat-treated. All test bars were turned to a uniform diameter of 1.129 inch.

The results were rather astonishing, particularly as there was a general feeling that cast-iron heated to a cherry red would be deteriorated by the treatment. The raw bars pulled within 300 lb. of the original test upon the same material, the bars that were treated with the mass pulled about 15 per cent higher than the raw bars, and the bars that were taken out after treatment of the mass showed an increase of 12 per cent in strength over the raw bars. The bars cut from the mass before treatment and treated with it showed an enlargement of from 0.005 to 0.0075 in. in diameter and a slight increase in length. Every care was exercised to locate the measuring points upon the bars in exactly the same place, and each bar was seated privately so that there was no possibility of mixing them.

The result of these experiments would seem to indicate that cast iron was not only increased in size by heat-treatment but that its material characteristics were also improved thereby. Whether or not the composition had anything to do with the result the experiments did not go far enough to determine, and this would seem to be an excellent field for further experimentation.

The Foreman and the Community

By A. W. Brown

As a rule, neither the management nor the mass of workers thinks much of "the community"—who constitute it, where they live, move and have their being and what their rights may be. Probably the foreman is much better fitted than either the management or the working class under him to give a thought to that "class," which is not a class, because it comprises all classes, and which has at least an indirect interest in all industrial comings and goings, thinkings and doings.

Problems of the Die Head Manufacturer

Factors Affecting Design and Manufacture—Construction and Details of Manufacture—Why Parts for Special Threads Are Costly

By C. W. BETTCHER
Sales Manager, Eastern Machine Screw Corporation

IT MAY safely be assumed that few users of self-opening die heads realize the complexity of the problem with which the manufacturer of this class of tool is confronted.

To gain some idea of the magnitude of this problem, it is necessary to consider the following factors: (1) The variety of thread forms used upon articles of modern manufacture; (2) the multiplicity of sizes and pitches in which each thread form must be produced; (3) the various kinds of material upon which threads are cut, and (4) the kind and condition of the machine and the degree of intelligence and interest displayed by the workman who operates it.

THIS OUTLINE, in addition to suggesting what is possible in self-opening die heads, emphasizes the importance of selecting threads wherever possible from tables already considered as standards.

Following such a procedure will mean not only more prompt service in the matter of chaser deliveries but also better deliveries from the manufacturer of taps and gages, and lower costs.

Of thread forms we have in common use the U. S., V, Acme, Whitworth, British Association, Cycle Engineering, French, Standard-International, pipe threads and many special shapes. Each may be required in either right- or left-hand, in any pitch from 3 to 110 per inch, and of any size from $\frac{1}{16}$ to 3 in. in diameter. Added to the above list is the possibility of having to furnish any one or all of them in double, triple or even quadruple pitch.

The complexities are still further swelled by the fact that many kinds and sizes of thread may be cut with several sizes or styles of die-head, making it necessary for the manufacturer to increase his stock of chasers by that number in order to meet all requirements. In fact, a recent inventory at this factory disclosed approximately 1,300 varieties of the combinations given above.

While this outline is designed to suggest the great possibilities of the self opening die head, it may serve in even greater measure to emphasize the importance to the customer of adopting for his work some form and pitch of thread that is already to be found in standard tables. The special thread not only is usually an arbitrary requirement on new work, but actually increases production costs for the reason that the special tools and gages must be made at a cost many times in excess of the cost of standard equipment, to say nothing of longer time it will take to get them. It is the practice of the Eastern Machine Screw Corporation, and I believe of most die head manufacturers, to simply make an extra charge for the cost of the hobs when special chasers are ordered and to absorb the other losses.

The manufacture of chasers is work that cannot be hurried. In ordering new or special thread forms, pitches, etc., the customer should remember that any deviation from standards already set involves the making of tools for the production of the new chasers and that with the making hardening, grinding, and testing of these tools, thirty operations are introduced, all of which tend to lengthen the time required for deliveries. Allowances in delivery should be made upon all orders for chasers that differ in any detail from those that have hitherto been made. A recent inventory disclosed the fact that there are well over 1,750 different kinds of chasers in stock ready for immediate shipment. When it is considered that in some of these chaser sizes hundreds of chasers must be available on any one order it will be seen what this investment must mean in order to give the proper service to the customers in the matter of chaser deliveries.

Difference of material upon which threads are to be cut involves a difference in minor details of the tools that are to cut them, even though the thread characteristics may remain the same. Though cold-rolled screw stock is by far the most commonly used material upon which threads are cut, nickel, chrome-nickel, chrome vanadium and other steels (some heat-treated) cast-iron, cast brass, bar brass, tubing, aluminum, fiber, hard rubber and even celluloid are often used. Fig. 1 shows a few examples of the threads and materials. Each material requires a careful study of its characteristics in order to be sure that tools will render satisfactory service upon it.

Self-opening die heads are used upon automatic single and multiple spindle screw machines of different designs and principles, bolt threading machines, hand screw machines, lathes, drill presses and many special machines. In some of them the die head revolves while the work remains stationary, in others it is the material that revolves. Some rotate both work and head at differential speeds. All of these things have a bearing upon the kind of die head to be used and must be taken into consideration by the manufacturer who supplies the tools.

Not the least important of the variable factors is the workman who has the handling of the tools. Though the equipment may be beyond criticism and perfectly adapted to the work it is expected to do, all the study and forethought of the tool manufacturer may speedily be brought to naught by a careless, indifferent or ignorant workman who may run the tools at speeds for which they were never designed or may allow the supply of lubricant to fail at a critical moment.

The self-opening die head has, however, reached such a point of perfection in detail, rigidity and reliability

of action that with proper supervision in the matter of grinding chasers and suitable instruction to the workman in the use of it, the tool can be depended upon to produce work upon a quantity production basis that will equal in accuracy the best product of the toolmaker's skill.

The following points are essential to a successful die head. It must be simple in construction so that it will function instantaneously; it must be strong and rigid that it may stand up to its work continuously without its operation being affected by working conditions; it must hold the chasers firmly and in the most advantageous manner so that there will be no yielding under pressure of the cut; all parts must be carefully hardened to insure against undue wear; and all parts must be ground after hardening to extremely close tolerances so that old and new sets of chasers may be interchanged as necessary and the changing from one style of die head to another style of the same size effected without difficulty. These requirements involve not only the most exacting methods of manufacture but a system of inspection that will enable the manufacturer to keep the limits of tolerance under his strict observance and insure perfect workmanship and interchangeability.

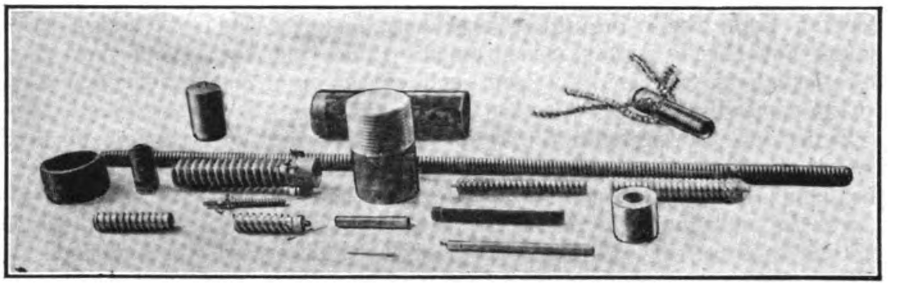


FIG. 1. EXAMPLES OF THREADS AND MATERIALS

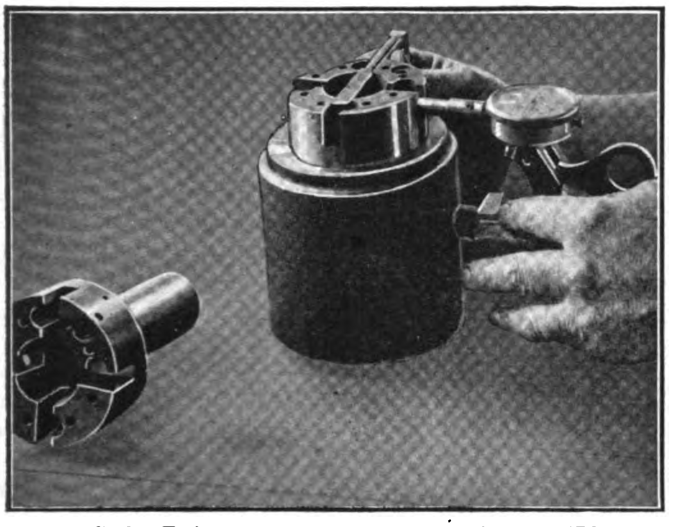


FIG. 2. TESTING THE HEADS FOR SYMMETRY

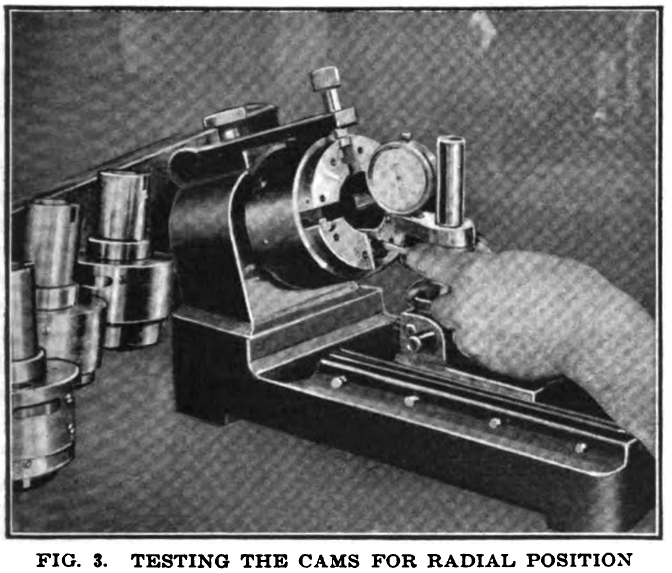


FIG. 3. TESTING THE CAMS FOR RADIAL POSITION

An important feature of the construtcion of a self-opening die head is the slot in which the chasers move. These slots must be ground to accurate dimensions so that chasers, old or new, will be a close sliding fit without perceptible shake, else chattering and consequent imperfect work will result. Besides accurate dimensioning it is of extreme importance that the slots be symmetrically disposed with relation to each other and to the axis of the die head.

In Fig. 2 is shown how the heads are tested in this respect. Go and no-go gages are used to keep the width and depth of the slots within limits while the bar gage and indicator enable the inspector to detect errors of a very small fraction of a thousandth in location. Tolerances, even on large scale production, are held as closely as in the most exacting tool work.

In Fig. 3 may be seen the method of testing the cams to make sure that each bearing surface is exactly the same distance from the axis of the head. Here, again, the tolerance must be very close, for any variation in this respect would mean that the work of threading would fall unevenly upon the chasers, resulting in bad work and the rapid deterioration of the chaser that was bearing the brunt of the burden.

Turning now to the chasers we find that it is a matter of vital importance in tooling up for their manufacture for exactly the right amount of clearance. However slight this may be, it is very essential to a free cutting tool. We have to control the clearances from the cutting edge back around the screw and also from the throat to the rear. Though these clearances are difficult to measure, they must be maintained within definite and very close limits.

The length of each chaser is another important feature; "length" in this case meaning not the over all length but the distance between the pitch diameter of the thread and the point where the chaser takes its

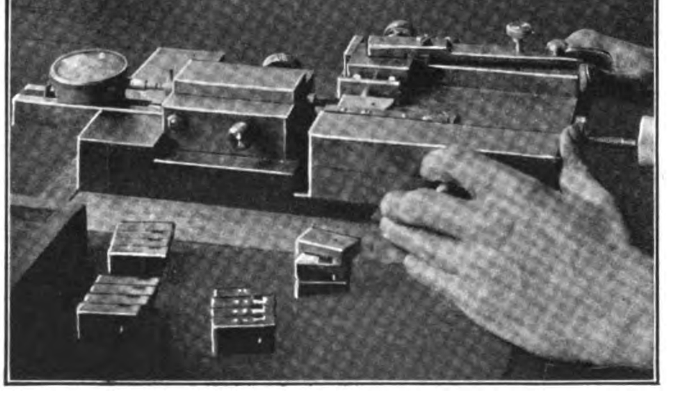


FIG. 4. TESTING THE CHASERS FOR LENGTH

bearing upon the cam. In Fig. 4 may be seen the device for checking this measurement, indicating the care which is exercised to keep each chaser in a set to the same dimension.

Experience throughout the war in the matter of thread specifications, the importance of having accurate and smooth threads in high-speed engines, such as those for automobiles, airplanes, etc., has made us critical in this respect. For many years the manufacturer of die heads has seemed to have the advantage over the manufacturer of taps, but within the last year or two the latter has made very rapid strides and taps are now available that will cut threads beyond criticism.

Threads on chasers are cut by the hobbing process and as these threads can be no better than the hobs that cut them, the designing and making of the latter constitute no small part of the problem with which the manufacturer must deal. This phase alone calls for a vast amount of gaging and testing apparatus in the inspection department.

Though the self-opening die head cannot be said to be a new thing as mechanical inventions go, it has undergone a wonderful development within the past few years. Considered but a short time ago as a tool capable of producing a "good enough" thread, it has been improved by strengthening its parts, closing up its limits of tolerance, and extending its range of usefulness until now it may be depended upon to produce in hundreds of thousands many kinds of threads and worms once thought impossible for it, and this to a degree of accuracy hitherto regarded as unattainable except by the most laborious and painstaking methods.

Notwithstanding the rigor of present-day thread specifications in the matter of form, lead and smoothness of finish, the die head is meeting them with ease and regularity, and this has been made possible largely through the efforts of a comparatively small group of manufacturers who, having faith in the possibilities of the tool and the determination to demonstrate it have devoted their time and skill to overcoming the difficulties one by one as they have arisen.

Time and Motion Study vs. Red Tape Wage Systems

Premium Earnings Should Not Be Used to Control Wage Fluctuations — Time and Motion Study Is Too Frequently Confused with Rate Setting

BY GAYLORD G. THOMPSON
Production Engineer, Pawling & Harnischfeger Co.

"IT APPEARS to me that we are beating around the bush in our methods of wage payments." These were the words of a general manager, uttered at an executive meeting. "I had occasion to visit ——— & Co. the other day," he continued, "and I was very much impressed by the small clerical force they employ to keep records of their labor and manufacturing costs. They have no premium or piece work in their plant, consequently prodigality of forms and records does not exist. The workers are paid on a flat hourly basis. Upon completion of a job, it was not necessary to pass the labor record through a multitude of hands to complete the calculations of labor costs. I will venture to say that if I take any foreman in our shop and walk with him through any department with which he is not familiar, he will be unable to tell me which of the workers, judging by their application to their work, are on premium and which on straight work. When I walk through the shop and witness an apparent equality in production and physical exertion of employees on premium jobs and those working on a flat wage rate, I am forced into the opinion that our premium system is availing us nothing. It appears to me that our premium system has degenerated from an incentive toward increased production, to a red tape method of the application of a wage payment system."

At this meeting the subject of retrenchment predominated. To the exponents of the premium system of wage payments supplemented by the application of time and motion studies, the words of the general manager contain a challenge to the arguments for efficiency based upon time and motion study. They perhaps typify the opinions of many executives who are inclined to discount the value of time and motion studies as a basis of establishing efficient manufacturing methods and rates. Evil germinates from a cause, consequently every evil attributed to the functions of time study must have its cause. The harvest resulting from the seeds of time study is in proportion to the knowledge and care taken in their planting and cultivation. To condemn time study, when the fault lies in the misapplication of its fundamental principles, is just as logical as mixing yellow and blue together and condemning the mixture because it is not white instead of green.

There was a time when the majority of manufacturing concerns having premium systems in their plants, would hire their employees at a certain rate per hour that was satisfactory to the employee regardless of whether he worked premium or piece work. Premium earnings of 10 to 15 per cent in excess of the flat wage rate of the worker were considered sufficient incentive for increased effort and met with satisfaction because the wage rate was high enough to counteract any tendency toward dissatisfaction should the worker be called upon to perform duties on which no premium rate had been established.

Before the World War, the evolutionary development of time study had progressed so far that time study was becoming an essential factor in progressive and efficient manufacturing methods. Unprecedented prosperity, resulting in riotous clamor for production regardless of cost, had the effect of partially breaking down the structure constituting the fundamentals of time and motion study. In the efforts to comply with

the demands of labor for increased remuneration, premium rates were established from past performance records of employees. This was found to be the most convenient source of realizing quick results. Right here is where we discover the cause of the "apparent equality in production and physical exertion of employees on premium jobs and those working on a flat wage rate."

When premium rates are based upon the past records of employees without due consideration of the effect of inefficient operation methods, the whole affair resolves itself into a red tape method of wage payment and nothing more. Premium rates as based upon the conclusions of time study are supposed to incorporate an element of incentive toward increased production. Rates which are based upon the performance of the individual rather than upon time study, will eventually defeat their purpose because the facts relating to the details of the operation affected are not available. Thus we have as a result of all this, nothing more than an estimate.

In carrying out their plans of retrenchment, many manufacturing concerns will find that their employment managers have been hiring help on the basis of so much per hour and a promise of additional premium earnings. Although dissatisfied with the low base wage rate, the worker upon being employed will always bear in mind the prospects of premium earnings counteracting the low flat wage. After he has been assigned to his job and finds that his premium earnings do not come up to his expectations he will either demand an increase in premium allowance or quit. Almost invariably in the past these demands were granted promiscously in order to keep the worker on the job. If they were not met, the subsequent increase in labor turnover was traceable to the employment man because of the impression he created in the mind of the worker at the time he was employed.

The Employment Man's Troubles

We cannot, however, place the blame on the employment man for this state of affairs. His troubles were plenty when labor was scarce. In many cases his inability to meet competitive bids for labor on the flat hourly basis compelled him to inform the prospective employee of every possibility of increased earnings over the flat wage rate.

The works manager of a certain concern was constantly beset with requests for increased wages. Every morning his desk was stacked with application forms for wage increases submitted to him by various foremen for his approval. To stem the tide, he called all of the foremen and superintendents into consultation and advised them that in the future no increases of the basic wage rates would be made where an employee had opportunities to work premium or piece work. Any increase in earnings of that class of labor would have to be realized by an increase in premium or piece work rates. In fact, where premium rates were established on a basis of the worker's making 25 per cent above his wage rate, instructions were given to assign the rates so that the worker would realize approximately 50 per cent additional earnings.

This had the effect of turning the demands for increased earnings into the channels of the time-study division. Old established premium rates soon became the object of attacks by disgruntled workers. There was no alternative for the time-study men except to increase these premium rates in order to maintain harmony and satisfaction of the workers and at the same time keep within the scope of premium rate adjustments as promulgated by the works manager.

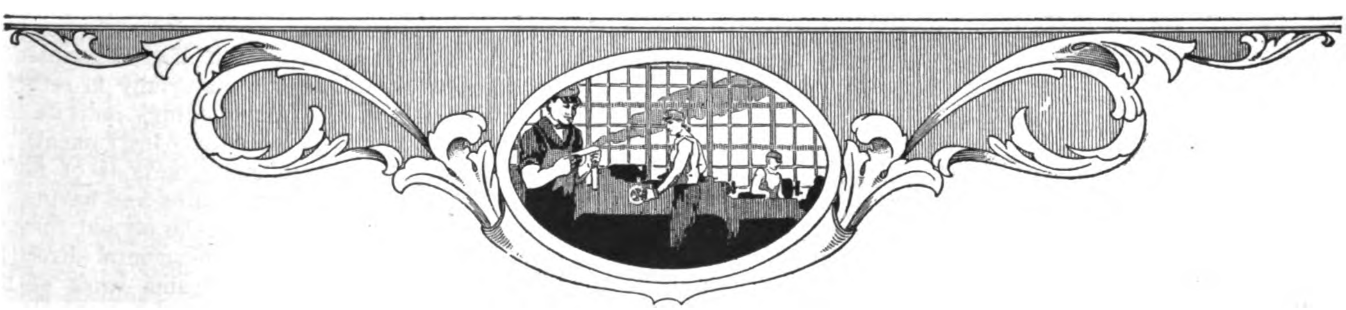
Premium Earnings Must Not Be Used to Control Wage Fluctuations

It is obvious that attempting to use premium earnings as a control of wage fluctuations will directly affect the method by which the employment man engages help. The very moment that such an attempt is made the embryo of a red tape method of wage payment comes into existence.

Fundamentally, it is wrong to establish low wage rates and depend upon the premium system to keep the workers satisfied. When a concern has reached the point where a guaranty of premium earnings must be given in addition to the basic wage rate, it would be far better to discontinue premium work and bring the wage rate up to the approximate unit level of the average combined wage rate and premium earnings of the individual employee.

Overhead would be reduced considerably by the elimination of extra clerks required to calculate the pay roll under the wage-rate-plus-premium method of wage payments. Efficient supervision in the shop should also contribute to further the economy effected by this reduction in overhead, especially in a manufacturing concern which maintains a department masquerading under the title of "Time Study" when as a matter of fact its functions are merely the allocating of rates.

The name of "time study" has been erroneously applied to departments having functions that do not in the least interpret such a title. Such faulty application of the title is a contributary factor in bringing time study into disrepute. For example to call a "rate-setting" department a "time-study" department is fundamentally incorrect because all of the evils arising from rate setting, which may lack the research and analysis of time study, would be placing the blame on time study.

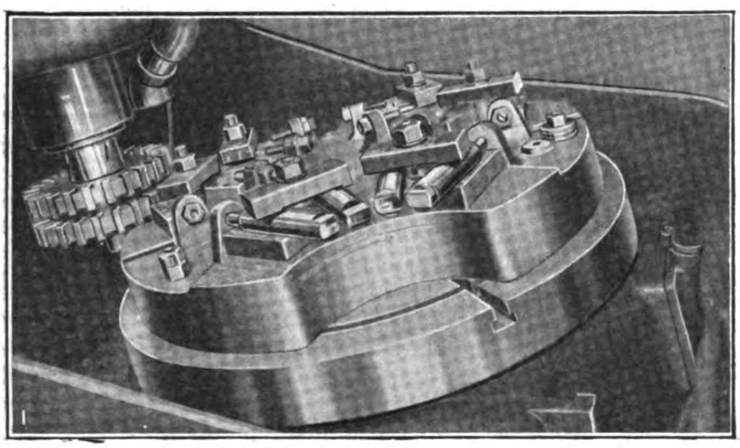


Miscellaneous Operations on the Mack Truck

Special Milling Fixtures and Operations—Centerless Grinding—Using the Thread Comparator—Making Radiators, Cabs and Hoods

By FRED H. COLVIN
Editor, *American Machinist*

SOME of the miscellaneous machining operations in both the Allentown, Pa., and Plainfield, N. J., plants of the International Motor Company are particularly interesting, showing the adaptation of standard machines for special work by the use of ingenious fixtures. A case of this kind is shown on an Ohio tilted milling machine in Fig. 1, where it is necessary to flatten the ends of a large number of steel pins. It was desirable that the bottoms of the cuts be concave instead of convex, as would have been the case had they been arranged on the outside of the circular table and fed past the milling cutter. In order to make them concave, the pins are arranged for milling in groups of four, two being held by each single bolt strap, as this makes the easiest and simplest kind of a fixture to load. The back ends of the pins rest against the adjustable stops shown.



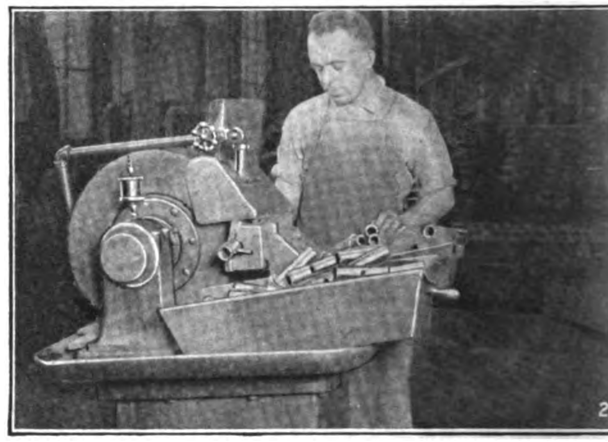
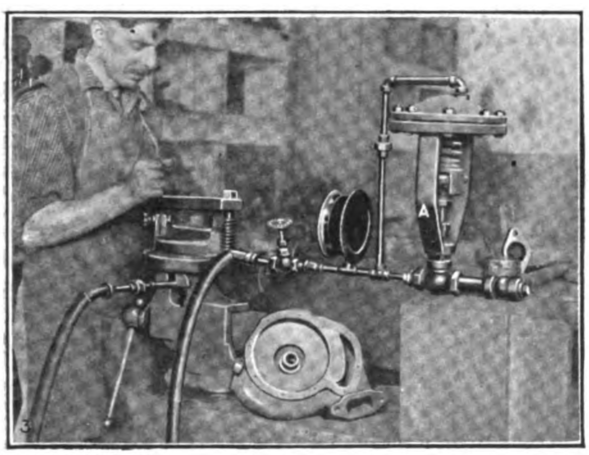


FIG. 1. SPECIAL FIXTURE FOR MILLING STUDS. FIG. 2. GRINDING PISTON PINS



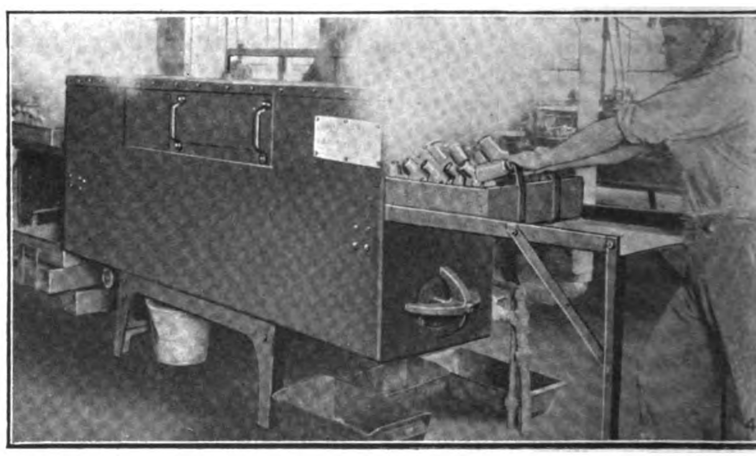


FIG. 3. TESTING WATER PUMP CASES. FIG. 4. WASHING PARTS BEFORE ASSEMBLY

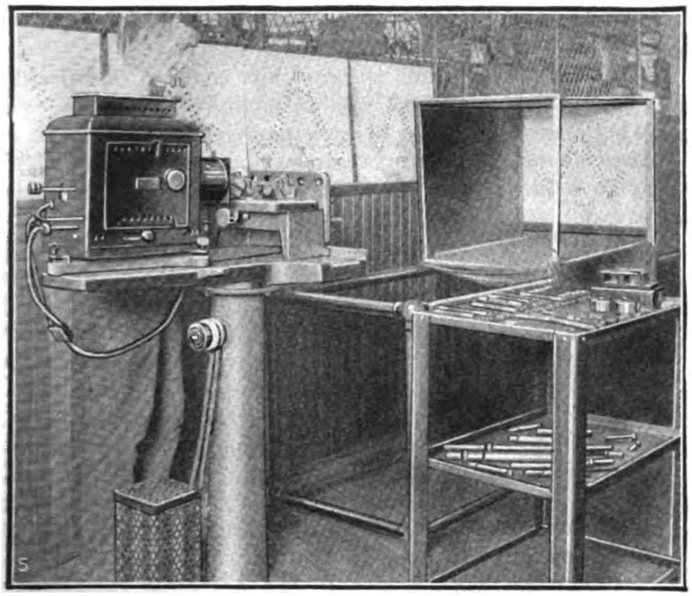
The table holds twelve pins in three groups of four each, and is readily indexed from point to point, and then fed in to the milling cutter. Four pins are milled at each stage of the operation and this method has proved very satisfactory in handling the work.

In Fig. 2 is shown a centerless grinding machine handling piston pins, a particularly interesting feature being the simple form of guides used. The guides are simply hardened steel strips set into the blocks shown, the result being satisfactory both as to output and quality.

The method of testing the water pump casting is shown in Fig. 3. The clamps shown hold the pump casting firmly in place while the pressure is being applied. The pressure regulator shown at *A* insures the proper pressure for each test made. One of the uses made of the Niagara metal-washing machine is shown in Fig. 4. Manifolds and other parts washed in such machines come out thoroughly clean and are ready to go directly to the assembly.

The Hartness thread comparator, Fig. 5, is used in every day shop work and assists materially in securing good screw thread fits. Its surroundings indicate that it is a shop tool instead of a laboratory instrument.

The radiator on the large Mack trucks is of rather peculiar design, being behind the motor and having the fan in the center, so that it throws the air out through the cooling coils instead of in a horizontal direction, as is usual in most cases. The frame work of the



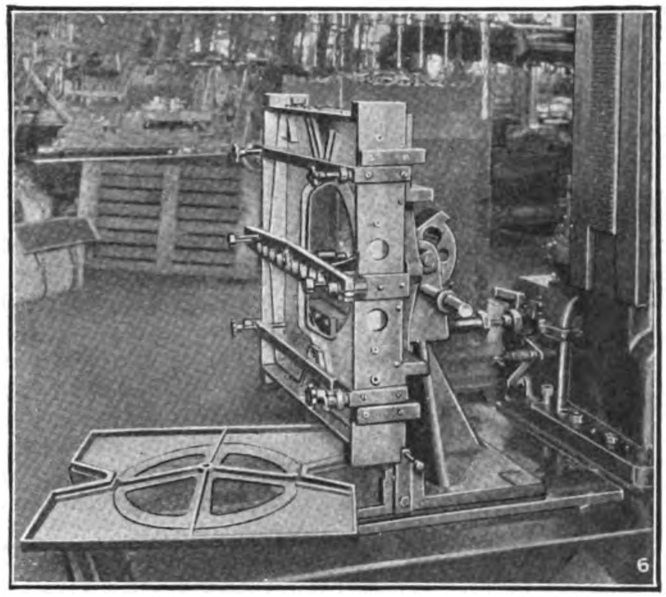
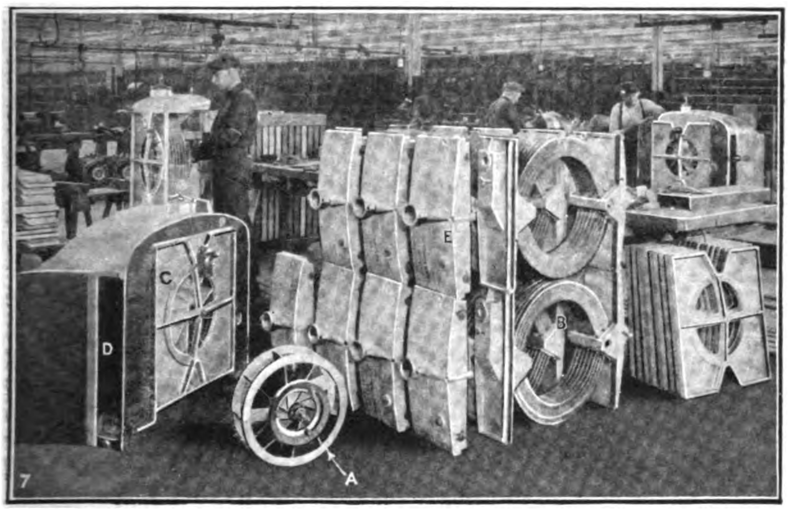


FIG. 5. USING THREAD COMPARATOR IN THE SHOP. FIG. 6. DRILLING RADIATOR FRAME



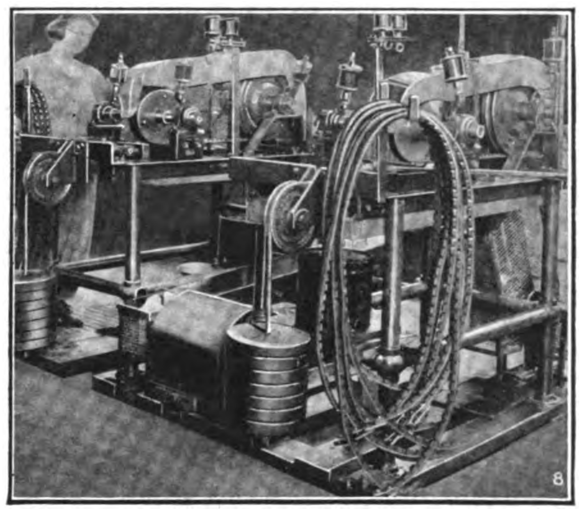
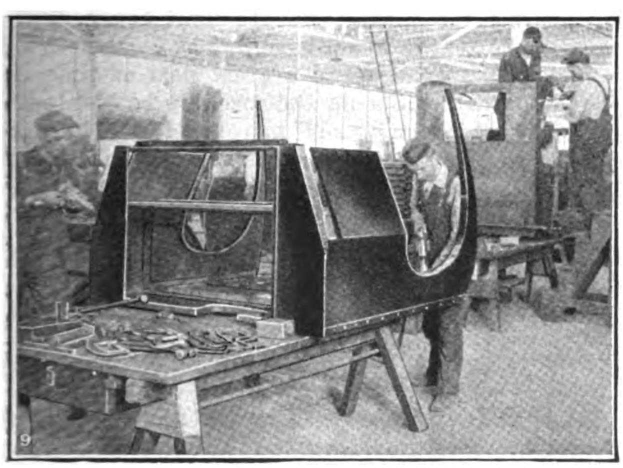


FIG. 7. RADIATOR READY TO ASSEMBLE. FIG. 8. TESTING THE FAN BELTS



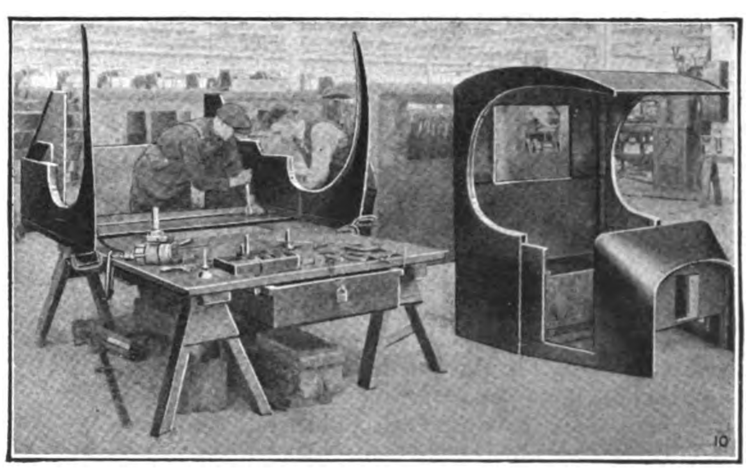


FIG. 9. BUILDING THE CABS. FIG. 10. A COMPLETED CAB

radiator is shown in Fig. 6, together with the drilling fixture, and some of the completed radiators can be seen in Fig. 7. The latter also shows one of the fans at *A*. The fan is mounted inside the circular coils *B*, as may be seen in the assembled radiator at *C*. The side openings in the cowl *D* permit air to escape at each side. The tank for the water supply is an aluminum casting shown at *E*.

Special V-shaped belts are used in driving the fan, and in order to insure satisfaction and prevent slippage while the belt is new, every belt is tested and stretched on the machine shown in Fig. 8. It is run for a given

time under a specified load as supplied by the weight shown. After stretching, it is cut to the proper length so that the user should have very little difficulty even while the belt is new. After testing, the fan belts are carefully wrapped in oiled paper to protect them from moisture.

The driver's cabs are both substantial and comfortable, as can be seen in Figs. 9 and 10. There is considerable work on the cabs as will be noted from the drilling, riveting and bolting up operations shown in the two illustrations. One of the completed open cabs is shown at the right of Fig. 10, and, as may be seen, the door slides back into the side of the cab body. Many cabs are completely enclosed in cold weather so as to afford ample protection for the drivers.

The making of the distinctive Renault hood consists of a number of cutting and forming operations. The final-assembly form is shown in Fig. 11, together with

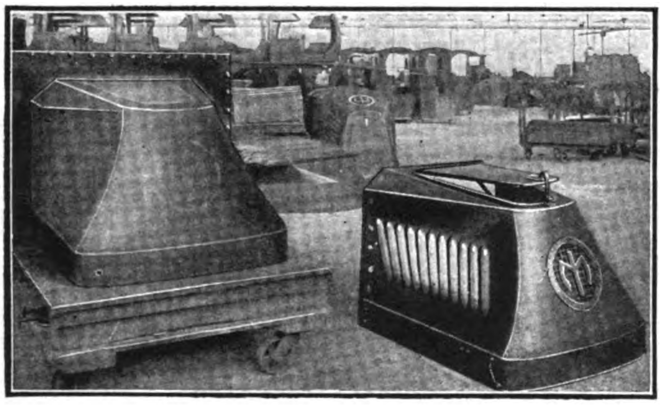


FIG. 11. A HOOD AND ITS FORM

one of the completed hoods. The form is mounted on a shop truck so as to be at a convenient working height and also to be easily moved anywhere in this department of the shop.

Putting Limits on All Dimensions—Discussion

By Alfred T. Gregory

None of us can give an inflexible rule for dimensioning machine drawings that will serve satisfactorily for all classes of work. Putting limits on dimensions is very practical when carried on with moderation. Beyond the usual practice, however, of making limits for dimensions requiring considerable accuracy, I am not in accord with John Thomas, who wrote the article "Putting Limits on All Dimensions," on page 639 of *American Machinist*.

Let us suppose that a new machine is to be constructed. In some shops a separate set of drawings would be made for the pattern shop, the machine shop and the assembly department. In each of these sets of drawings the draftsman will dimension the drawings to suit the needs of the particular department for which they are intended. In other shops one set of drawings serves all three departments, and the patternmaker must make allowance on his patterns for machining operations.

When the patternmaker receives the drawings and checks them over, is it necessary for him to have limits for his work? He knows how much to allow for certain machining operations. He can tell from the general appearance of the drawings whether $\frac{1}{16}$ in. off here or on there will make any material difference in the casting.

After awhile, when the castings come to the machine shop to be machined, the foreman will plan out just what has to be done to each part, and which machines they should go to for their various operations. If he is in a large shop he will probably call his assistants and job setters and talk it over with them.

It is quite certain that the foreman will know just how each part should be made, as a study of the drawings will give him practically all the information he will need. An experienced mechanic should know about how much to allow for practically all the dimensions that are not limited on the drawings. For instance, if the drawing gives one dimension for a particular part with a note, as driving fit or sliding fit, he knows what to do without any limits. Many times no note is needed to convey information. If he does not quite understand any particular part of the drawings, a talk with the designer will clear up all doubts.

When the work comes to the assembly department, some of it may have to be chiseled and filed, other parts may have to be drilled, etc. The foreman of the assembly department should have a thorough understanding of the mechanism of the machine, so that beyond possibly a few necessary limited dimensions, it would be a waste of time for the draftsman to attempt to put limits on all the dimensions.

In all shops there is a standard of workmanship which is what might be called an unwritten code, and it should not take a new man long to become acquainted with that standard. In large airplane and automobile shops where a high degree of workmanship is maintained, there is always a large force of inspectors whose duty it is to see that these standards are maintained.

It will be apparent from the foregoing that putting limits on all dimensions is unnecessary and impractical from the shop man's point of view. Now a word for the draftsman. Many times a drawing will be so crowded that to add limits to all the dimensions would make it practically impossible for anyone to understand it. Then too, it would add a great deal of unnecessary work to the draftsman's duties. It would take considerable time for a draftsman to limit every dimension, as very often he would have to look up the various tools and fixtures and spend a great deal of time collecting other data. Should the machine be wanted in a hurry, it would only add more delay to its final delivery. In the face of the great competition now existing among manufacturers, and also the way that everyone is trying to cut down expenses, it seems to me that the idea of putting limits on all dimensions is very impractical.

Clear Explanation

By Robert Grimshaw

It is one thing—and a good thing, of course—to know a thing thoroughly and accurately. But explaining it to another is an entirely different, and often equally important matter. Showing is sometimes impossible; doing so would necessitate doing the job, instead of having it done, which, where there is no repeat work, would be inadvisable and uneconomical.

The foreman must be able to analyze the job into its main divisions and explain each in sequence to the worker, in terms that the latter can understand and remember.

The Gleason System of Bevel Gears

Quietness in Operation, Strength and Durability Considered — Limiting the Undercut — Preference for Low Pressure Angle—Pressure Causes Wear

By F. E. McMullen and T. M. Durkan

FOR a long time need has been felt for a definite system of designing bevel gear teeth, which would give the most desirable tooth form for use under average conditions. It has been common practice in the past to use spur gear formulas, such as those of Brown & Sharpe, in figuring bevels. These formulas were worked out for an interchangeable spur gear system, which necessarily required some compromise. When they were applied to bevel gears, where interchangeability was not a factor, the possibilities of the involute curve were not fully utilized.

The Gleason 0.3 and 0.7 long and short addendum tooth was brought out to improve this condition, and various other alterations of the standard spur gear design have been used. For the most part these can be applied to certain combinations only and, therefore, are not universal. Recent applications of bevel gearing covering a wide range of ratios have made it imperative that a progressive system embracing all ratios and any number of teeth in common use, be worked out.

An investigation has been conducted by the Gleason Works to develop a practical system for designing the form of tooth that is consistent with strength and wear considerations, the quietest in operation. The results of this research have been incorporated in the accompanying tables. This system applies to any pair of generated spiral or straight tooth bevel gears operating at right angles where the pinion is the driver and has ten or more teeth. The bevel gears cut on the former-type planers are subjected to a special study as certain practical limitations prevent the application of the system to this class of gearing without modification.

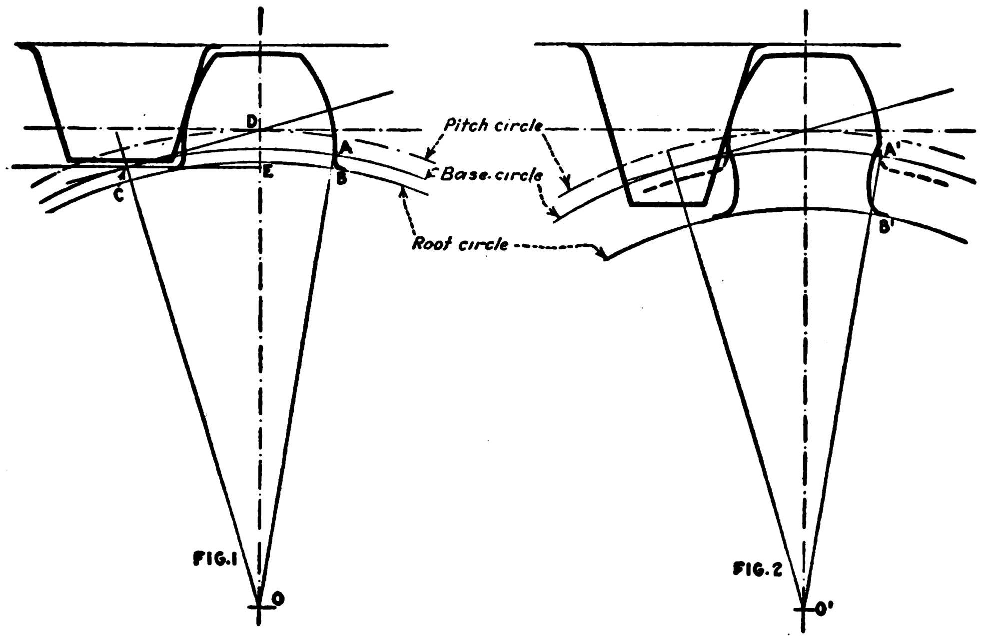


FIG. 1—INVOLUTE TOOTH IN MESH WITH RACK, SHOWING FILLET. FIG. 2—INVOLUTE TOOTH SHOWING UNDERCUT

The principal qualities considered in arriving at this system, arranged in the order of their importance, are quietness in operation, strength and durability. In regard to quietness, experience has shown that bevel gears cut with a lower pressure angle will operate more quietly than those with a higher one, other conditions being equal. There are several reasons which will account for this: With the lower pressure angle a greater arc of action is obtained; any eccentricity has less effect; and the radical component of the tooth load is minimized. Thrust forces also make it desirable to avoid the higher angle, not only because of the introduction of an axial or cone thrust not present in spurs, but also because the majority of bevel gears are overhung from their supports so that the total load should be kept as low as possible. For these reasons the basis of the system is the use of the lowest pressure angle which will not sacrifice strength by introducing an excessive undercut.

It might be well to describe here what is meant by undercut. In Fig. 1 is shown an involute tooth in mesh with a rack. The tooth profile consists of two parts, the involute curve which has its origin at *A* and continues to the top of the tooth, and the fillet *AB* lying between the base and root circles. If the rack, which represents the generating tool, does not project below the point *C*, beyond which involute action cannot take place, the fillet *AB* will always lie outside of a radial line *OA* drawn from the origin of the involute.

When the rack tooth is made longer so that it extends below point *C*, the condition shown in the exaggerated form in Fig. 2 is realized. In this diagram the fillet *A'B'* lies inside of a radial line *O'A'* and also slightly cuts away part of the involute curve. An examination of Fig. 1 shows that the value for the dimension *DE*, which is the distance from *C* to the pitch line, is equal to the back cone radius $DO \times \sin^2$ pressure angle. From this we might make a definition of undercut by stating that a generated bevel gear tooth is said to be undercut when the dedendum is greater than the back cone radius $\times \sin^2$ pressure angle.

However, it can be shown mathematically that it is possible to exceed this value considerably before there is any appreciable undercut. In fact for the ordinary automobile rear axle pinion having anywhere from ten to thirteen teeth, the dedendum is nearly always more than this critical value, and is sometimes as much as 100 per cent greater. The point at which to limit the

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undercut in the present system has been determined by a study of successful automobile practice, because that application represents a condition where both silence in operation and strength are paramount.

The 10-tooth—47-tooth, 14½ deg. spiral bevel ratio

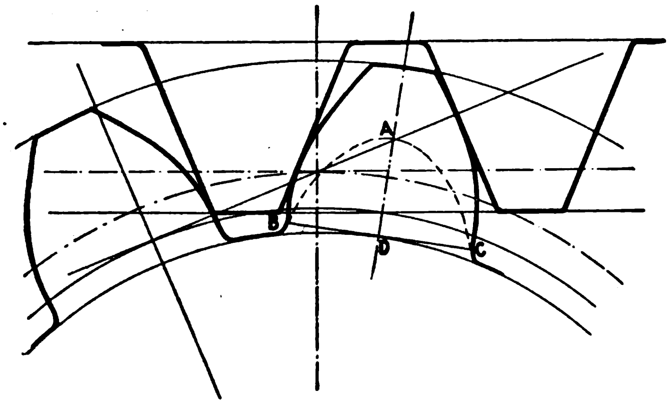


FIG. 3—THE GLEASON SYSTEM 10-TOOTH—47-TOOTH SPIRAL BEVEL RATIO WITH 14½-DEG. PRESSURE ANGLE

shown in Fig. 3 has a pinion dedendum 60 per cent greater than the back cone radius $\times$ sin² pressure angle, and although the undercut is about as great as for any tooth form in the spiral bevel system, it cannot be called excessive. Likewise the 14-tooth—16-tooth, 14½ deg. straight bevels in Fig. 4 represent as extreme a case of undercut as will be encountered in the straight tooth system, and yet they have a tooth profile which is not weakened to any great extent. The same ratio with a 17½ deg. pressure angle is shown in Fig. 5 but the strength of the gears is increased less than 5 per cent, although the increase appears to be larger.

The selection of a low pressure angle in preference to a higher one does not result in a considerably weaker tooth, as is ordinarily supposed, for the stronger section of the higher pressure angle tooth is offset by the greater arc of action with the lower angle. Reference to Figs. 3 and 6 will make this clear.

In Fig. 3 a 10-tooth—47-tooth ratio drawn with a

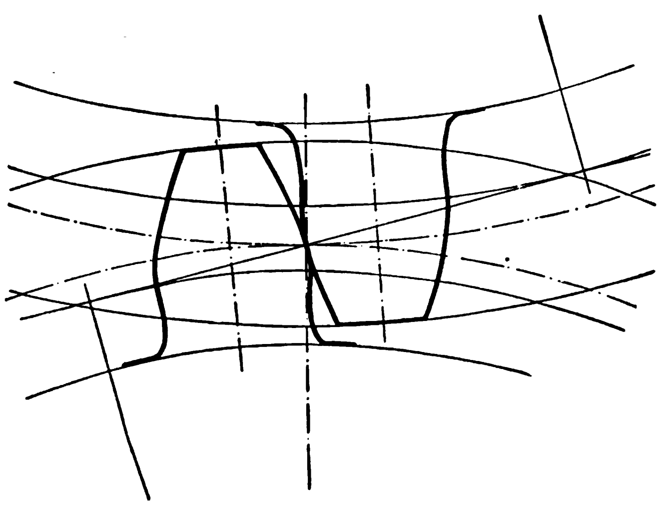


FIG. 4—THE GLEASON SYSTEM 14-TOOTH—16-TOOTH STRAIGHT BEVEL RATIO WITH 14½-DEG. PRESSURE ANGLE

14½ deg. pressure angle is shown and in Fig. 6 the same ratio is laid out with a 20 degree pressure angle. In each case the pinion tooth at the left is just on the point of engaging so that the tooth at the right is carrying the full load. This will be the worst condition of loading on each tooth as any further movement to the right brings another tooth into contact with consequent distribution of the load over two teeth, while movement to the left lowers the line of application of the force toward the base of the tooth. In this position the comparative strength of the teeth can be found by passing a parabola through the intersection, point *A* (see Figs. 3 and 6) of the line of action and center line of tooth, and tangent to the tooth profile. The value of $(BC)^2 \div AD$, which is a measure of the strength can then be obtained.

For the 10-tooth—47-tooth ratios shown in Figs. 3 and 6 the 20 deg. gear is about 14 per cent stronger than the 14½ deg. but the pinions are of equal strength. The 20 deg. ratio, however, is much worse for case hardening on account of the narrow width of top land. A pair of 15 tooth, 14½ deg. and another pair of 15 tooth, 20 deg. miter gears are shown in Figs. 7 and 8. Here the 20 deg. gear is less than 10 per cent stronger than the 14½ deg. gear.

This method of calculating the strength is similar to

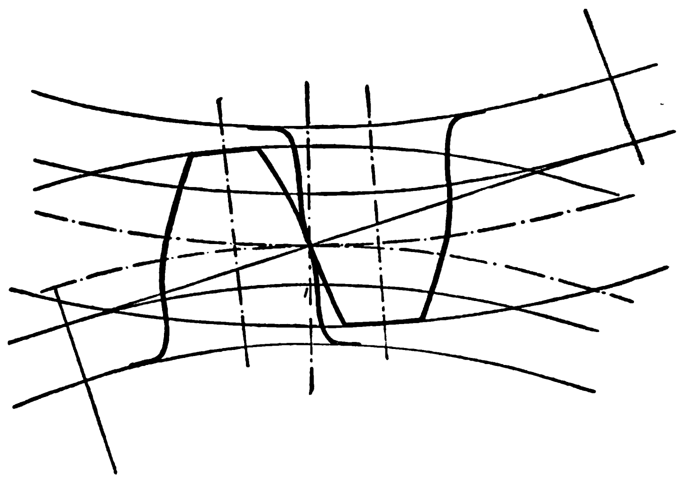


FIG. 5—A 14-TOOTH—16-TOOTH STRAIGHT BEVEL RATIO WITH 17½-DEG. PRESSURE ANGLE

the one used in deriving the Lewis formula, except in regard to the point of application of the load. The Lewis formula is based on the assumption that the load is applied at the end of the tooth, but in modern generating gearing this is a condition which practically never occurs. Prof. Marx in his experiments at Leland Stamford University, found that the force was not at the end of the tooth when failure took place, and also proved that the strength was increased as the arc of action became greater. From a consideration of these conditions, it is evident that the choice of a 14½ deg. instead of a 20 deg. pressure angle is not made at any extreme sacrifice of strength, but that for a large number of designs there is very little difference between the two.

The question of durability viewed from a theoretical standpoint would seem to resolve itself into a problem of obtaining a minimum of sliding and a maximum of rolling motion, as it is natural to assume that the wear would vary directly with the sliding action. But it is well known that the greatest wear often takes place near the pitch point where there is no sliding action. This is because the big factor causing wear is unit pressure and not sliding action. When the point of contact is near the pitch point all the load is borne by one tooth, while it is distributed over two teeth near the

beginning or end of action with a consequent reduction of unit pressure.

In Figs. 7 and 8 that part of the pinion profile which will wear most rapidly is *FG*, because it is forced to carry the whole load. On account of the lower unit

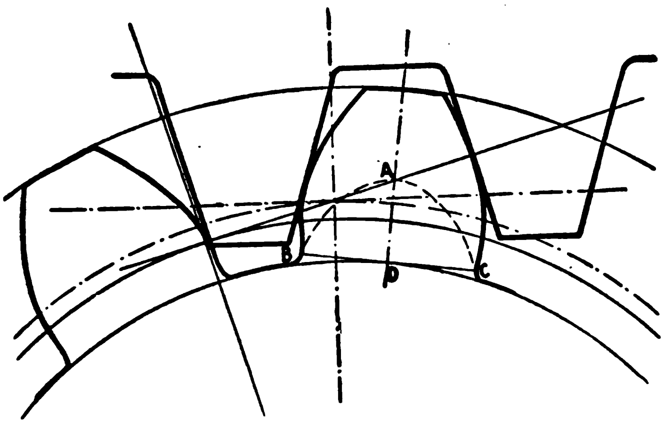


FIG. 6—A 10-TOOTH—47-TOOTH SPIRAL BEVEL RATIO WITH 20-DEG. PRESSURE ANGLE

pressure *EF* and *GH* will not wear as quickly even though the sliding action is higher. For this reason no attempt has been made in this system to maintain any predetermined percentage of rolling action but rather to balance up between approach and recess the amount of rolling already fixed by the requirements of quietness and strength.

Wherever possible, the action during approach has been favored in order to compensate for the change in direction of the friction component which tends to increase the obliquity of the line of action during approach and decrease it during recess. Account has also been taken of the high velocity of sliding action which occurs at the top of long addendum pinion teeth and which, in extreme cases, has led to abrasion. Safe values for this sliding action were obtained from jobs in service and the design was regulated so that these were not exceeded.

In establishing the various factors which go to make up the system, the aim was to arrange them in as simple and practicable a form as possible without sacrificing any of the three principal qualities of quiet-

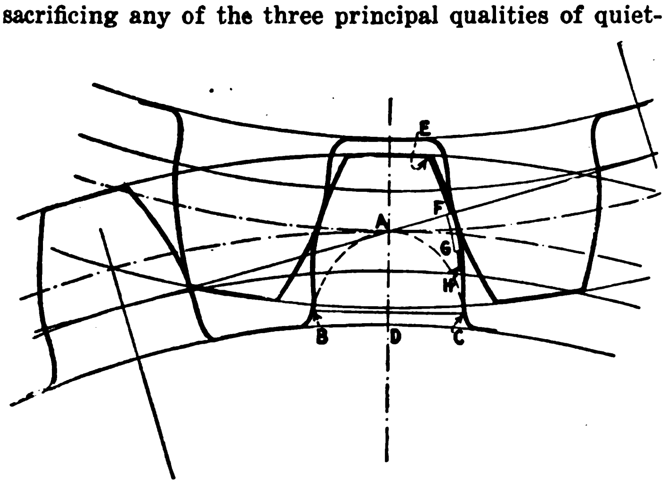


FIG. 7—THE GLEASON SYSTEM 15-TOOTH SPIRAL BEVEL MITER WITH 14½-DEG. PRESSURE ANGLE

ness, strength and durability. In a non-interchangeable system like the one here presented, any of the factors can be made to vary for each ratio and number of teeth. However, simplicity and the interests of standardization are opposed to expressing these factors as variable quantities where the probable accuracy of the assumptions made in determining them does not warrant it. An example of this is the pressure angle.

In a purely theoretical system the pressure angle might have any value. However, the same practical results are obtained in this system, which includes all ratios having ten or more teeth in the pinion, with the use of three angles of 14½, 17½ and 20 deg. for straight tooth bevels and of one angle of 14½ deg. for spiral bevels in all except a few unusual cases.

The pressure angle to be used for any given pair of gears is specified in Tables I and III, and has been selected as the lowest angle which avoids excessive undercut. The introduction of the pressure angle of 17½ deg., which is not universally used, is considered necessary in order to live up to the stated purpose of developing a practical system which will give the quietest form of tooth consistent with strength and wear.

It has been found by experience that there is a decided increase in noise when the pressure angle is changed from 14½ deg. to 20 deg., so that in order not to compromise the system when the undercut becomes

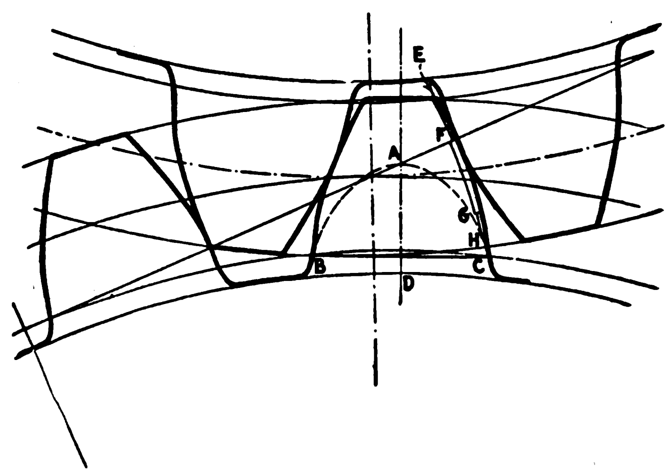


FIG. 8—A 15-TOOTH SPIRAL BEVEL MITER WITH 20-DEG. PRESSURE ANGLE

too great with 14½ deg., an intermediate pressure angle must be called for. The angle of 17½ deg. has been selected because it has already been used to quite an extent by different gear manufacturers. Although at least one pressure angle between 14½ deg. and 20 deg., which are 5½ deg. apart, is required, more are unnecessary. Any new angle would not differ by more than 1½ deg. from the three selected angles of 14½, 17½ and 20 deg. This change is too small to have any practical effect.

The working depth of tooth, which has been fixed as 2.000 in. ÷ D.P. for straight tooth bevels and 1.700 in. ÷ D. P. for spirals, has been successfully used for a number of years. For the average spiral angle of about 30 deg., the normal pitch is approximately 85 per cent of the linear so the normal section of a spiral tooth will have about the same proportion as a straight tooth.

Originally the working depth for both straight and spiral bevels was made to equal 2.000 in. ÷ D.P., but some years ago the depth for spiral bevels was decreased to 85 per cent of this amount because the top of the tooth on the normal was too thin and gave rise to hardening troubles. Stubbing the tooth more than 85 per cent decreased the arc of action and gave a noisier gear.

It would be desirable from a standpoint of standardization to use the same working depth for straight tooth bevels as for spirals, but after considerable experimenting along this line, it was found that straight bevels

TABLE I—FORMULAS FOR GENERATED STRAIGHT TOOTH BEVEL GEARS, OPERATING AT RIGHT-ANGLES WHERE THE PINION IS THE DRIVER AND HAS TEN OR MORE TEETH

Working Depth $\frac{2.000''}{D.P.}$

Full Depth $\frac{2.188''}{D.P.}$

Pressure Angle

Ratios having 14 or more teeth in pinion .... $14\frac{1}{2}$ deg.
Ratios 13-13 to 13-24-$17\frac{1}{2}$ deg. Ratios 13-25 and higher $14\frac{1}{2}$ "
Ratios 12-12 and higher .... $17\frac{1}{2}$ "
Ratios 11-11 to 11-14-20 deg. Ratios 11-15 and higher $17\frac{1}{2}$ "
Ratios 10-10 and higher .... 20 "

Addendum

Addendum of gear $= \frac{\text{addendum for 1 D.P.}}{\text{D.P.}}$ (from table)

Addendum of pinion $= \frac{2.000''}{D.P.}$ − addendum of gear

Dedendum

Dedendum of gear $= \frac{2.188''}{D.P.}$ − addendum of gear

Dedendum of pinion $= \frac{2.188''}{D.P.}$ − addendum of pinion

Circular Thickness

Circular thickness of gear for all ratios using $14\frac{1}{2}$ deg.
$= \frac{1.071''}{D.P.} + (0.5 \times \text{addendum of gear}) - \frac{K}{D.P.}$ (from table)

Circular thickness of gear for all ratios using $17\frac{1}{2}$ deg.
$= \frac{0.971''}{D.P.} + (0.6 \times \text{addendum of gear} - \frac{K}{D.P.}$ (from table)

Circular thickness of gear for all ratios using 20 deg.
$\frac{0.871''}{D.P.} + (0.7 \times \text{addendum of gear}) - \frac{K}{D.P.}$ (from table)

Circular thickness of pinion for $14\frac{1}{2}$ deg, $17\frac{1}{2}$ deg, or 20 deg.
$= \frac{3.142''}{D.P.}$ − circular thickness of gear

TABLE II—VALUES FOR STRAIGHT TOOTH BEVEL GEARS

ADDENDA FOR 1 D.P.

To obtain addendum select from table value corresponding to ratio given by this formula:-

$$\text{Ratio} = \frac{\text{Number of teeth in gear}}{\text{Number of teeth in pinion}}$$

Ratios From	Ratios To	Add	Ratios From	Ratios To	Add	Ratios From	Ratios To	Add	Ratios From	Ratios To	Add
1.00	1.00	1.000	1.15	1.17	.880	1.42	1.45	.760	2.06	2.16	.640
1.00	1.02	.990	1.17	1.19	.870	1.45	1.48	.750	2.16	2.27	.630
1.02	1.03	.980	1.19	1.21	.860	1.48	1.52	.740	2.27	2.41	.620
1.03	1.04	.970	1.21	1.23	.850	1.52	1.56	.730	2.41	2.58	.610
1.04	1.05	.960	1.23	1.25	.840	1.56	1.60	.720	2.58	2.78	.600
1.05	1.06	.950	1.25	1.27	.830	1.60	1.65	.710	2.78	3.05	.590
1.06	1.08	.940	1.27	1.29	.820	1.65	1.70	.700	3.05	3.41	.580
1.08	1.09	.930	1.29	1.31	.810	1.70	1.76	.690	3.41	3.94	.570
1.09	1.11	.920	1.31	1.33	.800	1.76	1.82	.680	3.94	4.82	.560
1.11	1.12	.910	1.33	1.36	.790	1.82	1.89	.670	4.82	6.81	.550
1.12	1.14	.900	1.36	1.39	.780	1.89	1.97	.660	6.81	∞	.540
1.14	1.15	.890	1.39	1.42	.770	1.97	2.06	.650			

VALUES OF "K" FOR CIRCULAR THICKNESS FORMULA

Select value corresponding to number of teeth in pinion and ratio given by above formula.

Number of teeth in pinion / Ratios →	1.00 to 1.25	1.25 to 1.50	1.50 to 1.75	1.75 to 2.00	2.00 to 2.25	2.25 to 2.50	2.50 to 2.75	2.75 to 3.00	3.00 to 3.25	3.25 to 3.50	3.50 to 3.75	3.75 to 4.00	4.00 to 4.50	4.50 to 5.00	5.00 and higher
10	.025	.070	.100	.120	.140	.160	.175	.190	.205	.215	.225	.230	.240	.250	.255
11	.010	.015	.050	.080	.105	.125	.145	.160	.170	.180	.190	.195	.200	.210	.220
12	.000	.040	.070	.100	.120	.140	.155	.170	.180	.185	.190	.195	.205	.210	.215
13	.000	.015	.040	.045	.050	.060	.070	.080	.090	.100	.110	.120	.135	.150	.165
14	.000	.015	.030	.050	.065	.080	.090	.100	.110	.120	.125	.130	.140	.150	.160
15 to 17	.000	.000	.010	.020	.030	.045	.060	.070	.080	.090	.095	.100	.110	.115	.120
18 to 21	.000	.000	.000	.000	.010	.030	.045	.060	.070	.080	.085	.090	.095	.100	.100
22 to 29	.000	.000	.000	.000	.010	.030	.040	.050	.060	.065	.070	.070	.080	.085	.085
30 and up	.000	.000	.000	.000	.010	.025	.035	.040	.045	.050	.055	.060	.065	.070	.070

having an 85 per cent stub tooth were noticeably noisier in running than similar gears with the full depth tooth. Consequently, the standard of $\frac{2.000}{D.P.}$ in. has been retained for straight tooth bevels.

The bottom clearance specified in the system is $\frac{0.188}{D.P.}$ in. (which is 0.06 × circular pitch). This is the minimum amount which experience shows is necessary for the average job to insure against any bottoming of the teeth. In the past, 0.05 × circular pitch was used and was found to be insufficient, while 0.07 × circular pitch which was also tried out was more than required.

The method followed in proportioning the addendum and dedendum was to adjust them until the amount of sliding during approach was about the same or slightly less than the sliding action during recess. This also had the effect of making the arc of recess greater than the arc of approach, which is very desirable, since the recess action is quieter than that of the approach. To obtain these conditions it was necessary to decrease the gear addendum and increase the pinion addendum

TABLE III—FORMULAS FOR GENERATED SPIRAL BEVEL GEARS OPERATING AT RIGHT-ANGLES WHERE THE PINION IS THE DRIVER AND HAS TEN OR MORE TEETH

Working Depth $\frac{1.700''}{D.P.}$

Full Depth $\frac{1.888''}{D.P.}$

Pressure Angle

Ratios having 12 or more teeth in pinion $14\frac{1}{2}$ deg.
Ratios 11-11 to 11-19-$17\frac{1}{2}$ deg. Ratios 11-20 and higher $14\frac{1}{2}$ deg.
Ratios 10-10 to 10-24-$17\frac{1}{2}$ deg. Ratios 10-25 and higher $14\frac{1}{2}$ deg

Addendum

Addendum of gear $= \frac{\text{addendum for 1 D.P. (from table)}}{\text{D.P.}}$

Addendum of pinion $= \frac{1.700''}{D.P.}$ − addendum of gear

Dedendum

Dedendum of gear $= \frac{1.888''}{D.P.}$ − addendum of gear

Dedendum of pinion $= \frac{1.888''}{D.P.}$ − addendum of pinion

Circular Thickness

Circular thickness of gear for all ratios using $14\frac{1}{2}$ deg.
$= \frac{1.061''}{D.P.} + (0.6 \times \text{addendum of gear}) - \frac{K}{D.P.}$ (from table)

Circular thickness of gear for all ratios using $17\frac{1}{2}$ deg
$= \frac{0.976''}{D.P.} + (0.7 \times \text{addendum of gear}) - \frac{K}{D.P.}$ (from table)

Circular thickness of pinion for $14\frac{1}{2}$ deg. or $17\frac{1}{2}$ deg
$= \frac{3.142}{D.P.}$ − circular thickness of gear

TABLE IV—VALUES FOR SPIRAL BEVEL GEARS

ADDENDA FOR 1 D.P.

To obtain addendum select from table value corresponding to ratio given by this formula:

$$\text{Ratio} = \frac{\text{Number of teeth in gear}}{\text{Number of teeth in pinion}}$$

Ratios From	Ratios To	Add	Ratios From	Ratios To	Add	Ratios From	Ratios To	Add	Ratios From	Ratios To	Add
1.00	1.00	.850	1.15	1.17	.750	1.41	1.44	.650	1.99	2.10	.550
1.00	1.02	.840	1.17	1.19	.740	1.44	1.48	.640	2.10	2.23	.540
1.02	1.03	.830	1.19	1.21	.730	1.48	1.52	.630	2.23	2.38	.530
1.03	1.05	.820	1.21	1.23	.720	1.52	1.57	.620	2.38	2.58	.520
1.05	1.06	.810	1.23	1.26	.710	1.57	1.63	.610	2.58	2.82	.510
1.06	1.08	.800	1.26	1.28	.700	1.63	1.68	.600	2.82	3.17	.500
1.08	1.09	.790	1.28	1.31	.690	1.68	1.75	.590	3.17	3.67	.490
1.09	1.11	.780	1.31	1.34	.680	1.75	1.82	.580	3.67	4.56	.480
1.11	1.13	.770	1.34	1.37	.670	1.82	1.90	.570	4.56	7.00	.470
1.13	1.15	.760	1.37	1.41	.660	1.90	1.99	.560	7.00	∞	.460

VALUES OF K FOR CIRCULAR THICKNESS FORMULA

Select value corresponding to number of teeth in pinion and ratio given by above formula.

Number of teeth in pinion / Ratios →	1.00 to 1.25	1.25 to 1.50	1.50 to 1.75	1.75 to 2.00	2.00 to 2.25	2.25 to 2.50	2.50 to 2.75	2.75 to 3.00	3.00 to 3.25	3.25 to 3.50	3.50 to 3.75	3.75 to 4.00	4.00 to 4.50	4.50 to 5.00	5.00 and higher
10	.020	.055	.085	.105	.125	.125	.110	.120	.130	.140	.150	.155	.160	.170	.180
11	.030	.075	.105	.070	.085	.095	.105	.115	.125	.135	.140	.145	.150	.155	.160
12 to 13	.005	.015	.025	.035	.045	.055	.065	.075	.085	.095	.105	.115	.125	.135	.135
14 to 16	.000	.005	.015	.025	.035	.050	.060	.075	.085	.095	.100	.105	.105	.105	.105
17 to 19	.000	.000	.005	.015	.025	.035	.050	.065	.075	.085	.090	.090	.090	.090	.090
20 and up	.000	.000	.000	.005	.015	.025	.040	.050	.055	.060	.060	.060	.060	.060	.060

as the ratios of the numbers of teeth in the gear and pinion became greater. These values of addendums for gear and pinion were originally worked out for each ratio and number of teeth, and from an examination of them it was found possible to make an arrangement in a simple tabular form according to the ratios as shown in Tables II and IV, without any sacrifice of practical qualities.

Circular thicknesses were found entirely by making enlarged layouts in which the teeth were balanced up partly on a width of top land and partly on a strength basis. The formulas given in Tables I and III were worked out so that they would give the same results as were obtained from the layouts.

In conclusion it can be said that this system is not something new or untried but, in the case of spiral bevels at least, it is represented in practice by a large number of very satisfactory jobs. It also checks up closely with successful straight tooth bevel gear practice although the long and short addendum tooth has not been used as universally for straight tooth bevels as for spirals. The system, as presented, represents in a simple and usable form an intensive study of the question of bevel gear tooth design, treated from both a practical and theoretical standpoint.

It might not be out of place here to express the opinion that a standard non-interchangeable system is needed for spur gears, possibly along similar lines to the one just presented. In fact such a system should be of as great importance as a standard interchangeable system since a large proportion of spur gears, like bevels, are intended to operate in pairs only. The concessions made to allow interchangeability are so great that the case of the non-interchangeable gear should be granted as much consideration for a standard system as is given to the interchangeable gear.

Romances of Metal Working— The Sagas of Volund and His Sword

By H. H. Manchester

One of the most famous series of Norse Sagas has to do with Volund, the smith, and his magic sword, Gram.

Volund and his two brothers were famous smiths in the days of the early gods. As they kept the smithy ringing with their blows, they accompanied them with this song:

"Tick, tack, tock, tick, tack, tay,
Hey, merry comrades, hammer away:
When the iron's hot and the sparks do fly,
Something comes of it by and by."

Nothing was too wonderful for them to forge. One of Volund's masterpieces was a marvelous sword, Gram, of which he had learned the secret among the black dwarfs, who forged the sword of Freyer. He forged and broke it over and over many times until it had such a temper that it could not be broken by mortal strength. The edge itself he tempered with elf powder and dragon's blood until it would cut through anything.

Not long after the sword was made the brothers saw three beautiful Valkyries bathing, with their white wings laid aside on the beach. Seizing the wings they persuaded the maidens to remain and be their wives. This endured for seven years, during which period Volund forged numberless precious ornaments for his wife, Alvit, or All White. At the end of this time the Valkyries took their wings and flew away, but in the meantime Volund had learned to forge wings with which he could fly.

The other brothers went in search of their wives, but Volund remained, because All White had left him a magic ring which he had made, to which she must sooner or later return.

While asleep, Volund was overpowered by King Nidud, of Sweden, and carried away into slavery together with all his treasures. The sinews of his legs were cut, and he was set to work forging marvelous ornaments and weapons for the king. In the meantime, however, he stealthily forged himself wings like those of the Valkyries.

Not long afterward the king brought in his magic sword, Gram, to be refurbished. Volund secretly fashioned a duplicate of it and gave it to the king instead. Then in revenge he killed the two younger children of the king, made love successfully to the king's daughter, and putting on his wings, and taking his sword and the ring for All White, mounted the top of the castle, and after taunting the king with what he had done, flew away to find his wife.

The subsequent fortunes of this sword run all the way through the story of the Nibilungens and Wagner's operas, and were even said to have been traced down to our own country.

Odin, the king of the Norse gods, gave this sword to Sigmund, who used it to revenge the murder of his family by Siggeir and the Goths.

When Sigmund's time had come, Odin himself had to appear on the battle field and break the sword before Sigmund could be defeated. His young wife, however, gathered up the pieces of the sword and carried them with her to another kingdom.

When Sigmund's son, Sigurd, was a young man, Regin, another smith, urged him to go against Fafnir, a dragon who guarded a great treasure. For this purpose Regin forged one sword after another, but Sigurd broke them with ease. He then thought of the pieces of his father's sword which had been saved by his mother. He brought them out, and they were welded together by Regin. To try this weapon Sigurd struck it upon the anvil, and was amazed to see that it cleft the iron anvil from top to bottom. With it he slew Fafnir the dragon and obtained the treasure.

After this Sigurd, who appears in Wagner's opera as Siegfried, journeyed to awake Brunhild the beautiful Valkyrie, who had been condemned to sleep until a man without fear should rescue her. Her castle was entirely surrounded by flames, but the sword cut through them as easily as it did through iron. Later Sigurd was enchanted by Grimhild, queen of the Nibilungens, and married her daughter Gudrun, aiding her son Gunar to gain Brunhild as his wife. This brought about a situation which could only end in tragedy.

The sword descended to Attila and accounted for his victories. The legend runs that it later came into the possession of Charles IX of Sweden, then of Peter the Great of Russia, then Gustavus Adolphus of Sweden, and finally Frederick the Great. In each case it was supposed to have made its possessor, though he did not know it, unconquerable while he held it. It was even reported that it was sent by Frederick the Great to Washington with the message: "From the world's oldest to its greatest general," and in later years Congress actually purchased one of the swords left by Washington on the assumption, which was perhaps mistaken, that it had been sent to him by Frederick the Great.

Automotive Service Methods and Equipment

XI. Simplicity and Efficiency in Service Tools—Facing Valves—A Connecting-rod Fixture—Lapping Cylinder Bores

By HOWARD CAMPBELL
Western Editor, *American Machinist*

IT IS frequently found that the efficiency of a tool increases in proportion to the simplicity of its construction and the ease with which it is operated. The equipment of the service plant of the Chicago distributors for the Studebaker Corporation includes a number of tools that would come under this classification, some of which are described herewith.

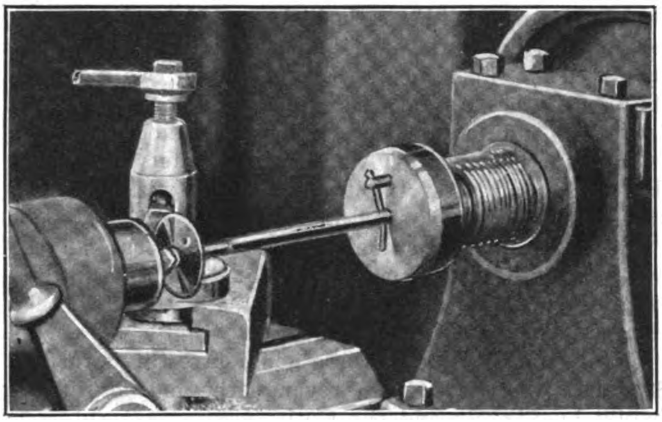
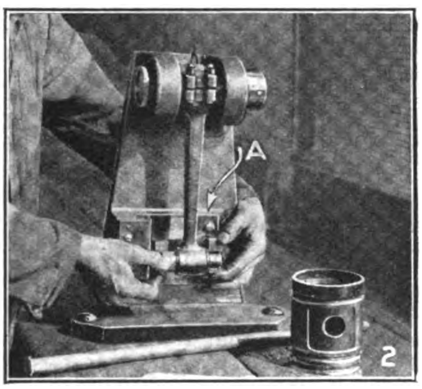
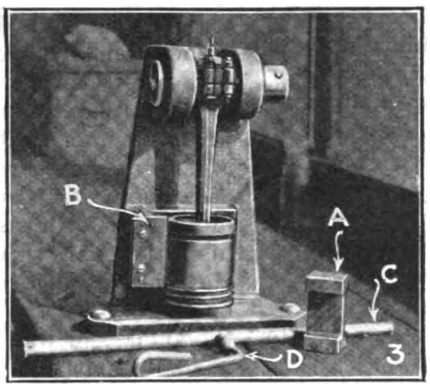


FIG. 1. FIXTURE FOR VALVE FACING

In Fig. 1 is shown a fixture for holding and driving a valve while the seat is being faced. The necessity for such a fixture arises from the fact that the end of the valve stem is centerless. The fixture is made of cast iron and has a taper shank turned on the back side, which makes it possible to hold it in the spindle of the lathe. A central hole is drilled in the face, to receive the end of the valve stem, as shown. A steel pin $\frac{5}{16}$ in. in diameter is driven or screwed into the face of the fixture, about 1½ in. from the center, which serves to drive a pin inserted in the hole in the valve stem, thus turning the valve with the spindle.

The method of testing a connecting rod for straightness is shown in Fig. 2. The shaft by which the large end of the rod is held in the fixture is of the same diameter as the crankshaft. A finished surface can be seen at *A*, against which the operator is holding the steel block shown at *A* in Fig. 3. A pin that has been ground to a push fit in the wristpin hole is inserted in the hole and aligned with the ends of the block. The center of the block has been milled out so that the rod will not interfere. If there is any twist in the rod, it can be instantly detected.





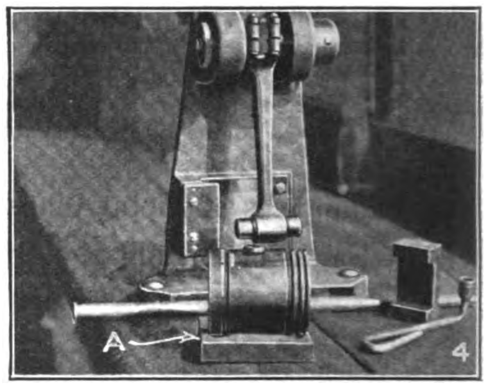


FIG. 2. TESTING A CONNECTING ROD FOR TWIST. FIG. 3. TESTING A CONNECTING ROD FOR STRAIGHTNESS
FIG. 4. TESTING WRISTPIN HOLE FOR SQUARENESS

A piston is now assembled to the rod and aligned with the steel block shown at *B* in Fig. 3. If the rod is bent or twisted, the small end of the bar *C* is inserted in the wristpin hole and the rod is straightened. The wrench shown at *D* is used to tighten the bearing cap bolts.

In case there is any doubt as to whether the wristpin hole is square with the axis of the piston, it is tested on the gage shown at *A* in Fig. 4. This gage consists of a steel block with a plane surface, in the center of which is a pin of the proper diameter for a running fit in the wristpin hole. The piston is placed on this pin and if the hole is not square with the axis, it can be instantly detected by the light that will shine through under one end of the piston.

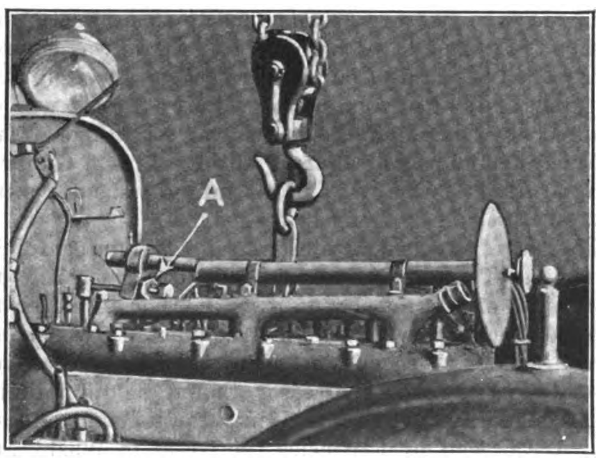


FIG. 5. METHOD OF HANDLING MOTORS

A very common method of handling motors is to screw an eye-bolt into one of the spark plug holes and then hook into the eye-bolt with a chain block. This throws the weight of the motor entirely on to the

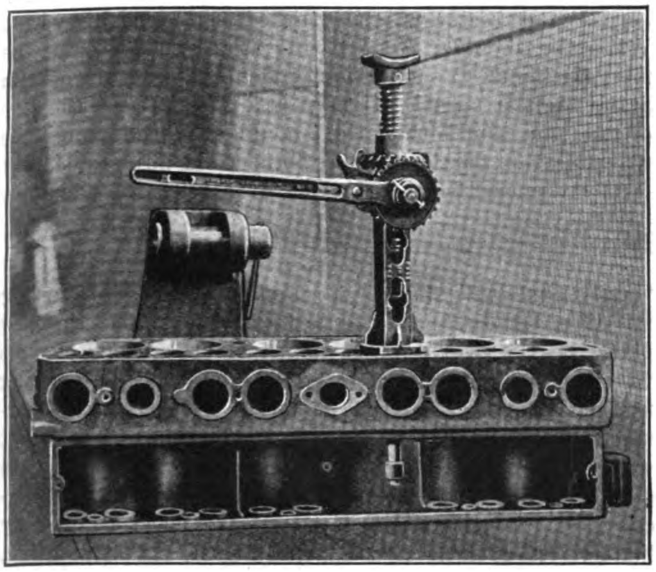


FIG. 6. VALVE GUIDE ASSEMBLING TOOL

threads of one hole. In this plant, however, a method has been devised whereby the weight of the motor is distributed over four holes, greatly reducing the possibility of damage to any one of them. Eyebolts are screwed into each of the four holes, two at each end of the motor, and each pair of holes is connected by a small shaft, as shown at *A* in Fig. 5. These small shafts are then attached to a larger shaft as shown, the larger shaft being in turn pinned through the center to a block into which a ring has been forged.

A tool for assembling valve guides to a cylinder block is illustrated in Fig. 6. This is nothing more nor less than an ordinary jack which has been converted to this use by the simple process of attaching a rod to the bottom end of the screw. The rod is small enough to slide through the valve stem hole in the valve guide, and long enough so that when the tool is set on the top of a cylinder, the rod will extend down through the cylinder far enough to allow a valve guide to be placed on the rod with room for a nut to be screwed on the end to hold the guide. The simple operation of "raising" the jack, by operating the handle

FIG. 7. POLISHING A CYLINDER BORE

up and down, then draws the valve guide into the hole. This tool has an advantage over some of the tools that have been placed on the market for this purpose, in that it pulls the guide straight in without the necessity of the rod's turning in the guide. The rod is attached to the screw by threading one end and screwing it into a tapped hole in the bottom end of the screw.

The operator shown in Fig. 7 is polishing a cylinder

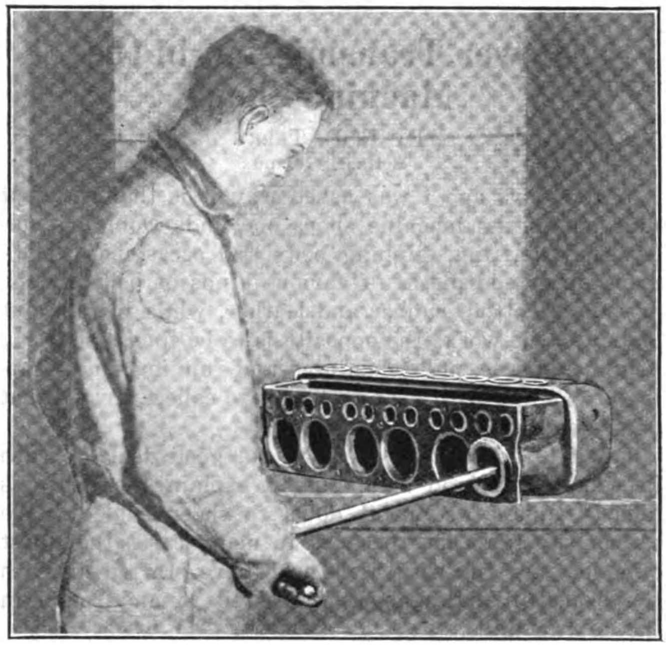


FIG. 8. LAPPING-IN A PISTON

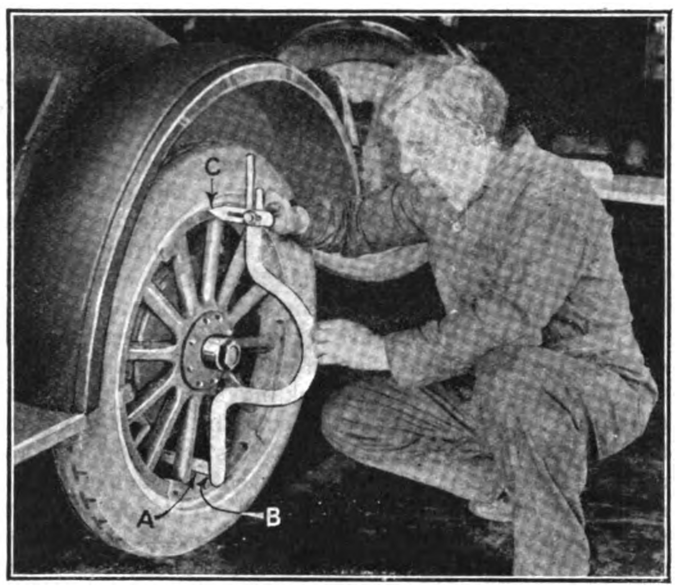


FIG. 9. TESTING AN AXLE FOR STRAIGHTNESS

bore with a wooden piston which has been covered with abrasive cloth. The piston is held by a pin through an eye in the end of the shaft and the tool is being operated by means of an electric drill. The grade of abrasive cloth used is varied according to the amount of polishing necessary, a coarse grade being used at first if much polishing is to be done, and crocus cloth being used to finish the operation. This method is frequently employed to make a bore the same diameter throughout its entire length, in cases where the piston has worn the cylinder larger at one end than at the other.

After the high spots have been polished out of the

cylinder bore, it may be necessary to lap the piston "in" so that it will be an easy sliding fit. A T-handle is used for this operation, an eye in the end of the shaft allowing the piston to be attached by means of a wrist-pin. Abrasive and oil are used to lap the bore until the piston will slide easily. This tool is shown in Fig. 8.

One form of gage used to test an axle for straightness is illustrated in Fig. 9. That part of the gage indicated at A is a straight bar that extends clear across and rests on the rim of the opposite wheel. When the shoulder B is resting against the side of the rim, the point C should just touch the side of the rim at its highest point. If there is a gap between the side of the rim and either the shoulder or the point, the wheel is not vertical. The point C is adjustable, but is never moved after being set even with the shoulder.

Power Transmission in the Machine Shop

By F. P. Terry
Belfast, Ireland

A few days ago I was asked why it is that in about nine out of ten machine shops one finds wobbling pulleys and shafting, slipping belts and occasionally belts made up of odd pieces of various kinds of belting such as balata, cotton, rubber and leather, while in nine out of ten textile works the opposite is to be found, shafting bright and true, pulleys painted and running true, bearings clean and with neat drip pans to collect any oil that may escape the bearings.

I had to admit that there was a good deal of truth in what my friend said, but to explain the cause is difficult unless we put it down to sheer neglect. We cannot say ignorance because in many cases the worst offenders are the very firms who have started up with the beautiful arrangements referred to and found in the textile mills.

One important factor is that very often line shafting and the care of it is in the charge of a millwright department that is quite content so long as things keep moving, and the machine shop foreman finds his complaints neglected or ignored altogether, with perhaps a gentle reminder to "mind his own business."

The purchasing of belting is frequently entirely in the hands of a buyer or purchasing agent, who buys entirely on price because it is the only thing he knows about. Usually the machine shop foreman can, as a special concession, specify the type of belting to buy, but whether it is leather, balata or any other kind he has to put up with the cheapest obtainable.

The above conditions are a moderate representation of what existed in a shop that I took charge of a few years ago, and, after tackling some of the most pressing problems directly affecting the output, I began to look at the things above. This brought me up against the foreman millwright whose principal argument was that things had been all right for the last twenty years and he was for leaving well enough alone; but after a good deal of noise about the noise above, I got a millwright under my own charge who also took charge of machine tool repairs. My next trouble was with the purchase of belting, which proved a difficult matter, because the buyer was on the office staff and not so easy to get at; also because of the fact that there is no definite standard in belting as in other furnishings. Even the best manufacturers make two or three grades and the purchasing agent who buys on price can always be accommodated, and in my opinion is very much to blame for the many types of poor belting manufactured today. In my case the belting used was the poorest quality imaginable and was no sooner on the pulleys than it developed the proverbial "dog's hind leg" shape. I remember well the starting up of a Landis universal grinding machine, the last place in the world on which to put a belt of this variety. It was a case of a different belt or sending the machine back to the makers. I also gave a personally conducted tour round a few more belts that were busy slap banging the belt forks as their main object in life. This resulted in the selection and purchase of all belting for my own use passing into my hands. Everything now appeared to be smooth sailing, but I very soon discovered I had a great deal to learn and I was greatly surprised at the amount of power lost and the excessive wear of bearings that can accrue from shafting that is out of line or not properly supported by bearings.

Regarding belting, I got many surprises. I read all I could find about it in back numbers of the American Machinist and other journals and found that if one wanted to get a certain speed from a driven pulley, belt thickness had to be calculated with the pulley diameters and the substitution of different thicknesses of belt changed the speeds; that badly twisted leather belting could be coiled tightly on a wood mandrel, placed in a chuck and faced up, after which, although reduced in width, it would do considerable service. I also found that running leather belts in the right direction with the lap joints made a very great difference to the life of the joints and that leather belting made of pieces over 4 ft. 6 in. long could be consigned to the class known as second-rate. In my own case I returned any over this length to the makers.

Up to this time I had no faith in any belting other than leather, but studying the subject I found that for motor drives where the motors are placed on side rails and free from belt forks, endless balata belts are hard to beat and are also easy to make; an intelligent beltman after one lesson can do the job satisfactorily. I also found that wide thin belts were preferable in most cases to narrow thick ones, and that belts subject to sudden reversal on machines such as turret lathes had a very short life when reversal took place from the countershaft, but that turret lathes reversed from the headstock did not have the same affect.

These and many other little matters kept me very busy for some months, but I was content in my own mind that the job was worth doing. At the end of the first year I was brought on the carpet by the buyer to explain why I had expended nearly two hundred pounds more in belting than ever had been spent in one year before, but very little explanation was necessary, in fact, before the end of another year I was asked to take over control of the shafting and belting for the whole works, which I did to the satisfaction of everyone concerned, more particularly myself, as I felt that in this one item, so often neglected in many shops, I was earning my salary.

Methods of Machine Tool Design

Beginning Fourth Section on Belting and Belting Applications—Belting Specifications, Elementary Principles, Kinds—Round Belts, Crossed and Quarter-turn Belts

By A. L. DeLEEUW

IT IS not the intention in these chapters to repeat statements or to give information which may be found in many standard works existing at the present day. Nevertheless, it will be necessary to point out some of the most important features of some of the elements used in machine-tool construction and to discuss their advantages and disadvantages.

Considering belts and belt drives we should look at them, in the first place, as means for power transmission and then note the limitations of such arrangements when applied to machine tools. There are single, double and triple belts. The belts we are most familiar with are made of oak-tanned leather. The very fact that we are so familiar with this class of belts is a disadvantage because we naturally take for granted that this kind must be used in all cases where a belt is applied to a machine tool.

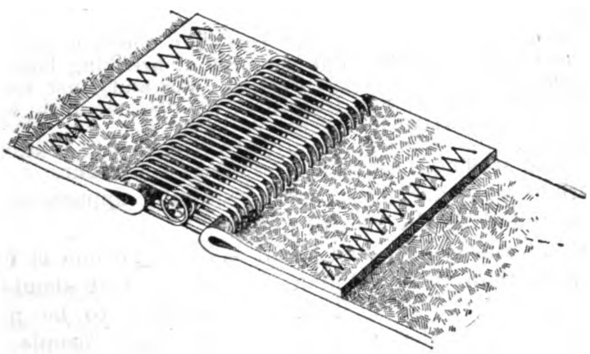


FIG. 31. METHOD OF JOINING CANVAS BELT

However, there are other kinds which have marked advantages in certain cases. For instance, though in the majority of machine-tool drives the oak-tanned leather is perhaps the best, in cases like planer drives where the belt must repeatedly pick up a load and start it in a very short period of time from a condition of rest to a condition of full speed oak-tanned leather is not the best for the purpose. The unavoidable slippage in this case has a tendency to burn the surface in contact with the pulley. In such cases chrome leather should be used, notwithstanding that it is not quite as strong as oak-tanned leather.

There are many cases in the heavier machine tools where it is not advisable to use a very wide belt and yet where we must provide sufficient strength of belt to transmit a large amount of power. This could be done by using a triple or even a quadruple belt, but in doing so we would need very large pulleys on account of the great thickness. In such cases a belt made up of leather and hard rawhide should be used. The rawhide is cemented between two layers of oak-tanned leather and is much thinner than either layer. As the unyielding layer of rawhide is in the center, it does not materially affect the flexibility of the belt, but it adds very much to its strength. The strength of this rawhide is 20,000 lb. per square inch section as compared to 5,000 lb. for oak-tanned belt. Where belts have to transmit a large amount of power, and at the same time may have to withstand a great amount of slippage, chrome leather with rawhide in the center meets the condition. There are cases where a chrome leather belt, though properly meeting the condition of slippage, is not quite strong enough for the purpose. In such cases a double belt is made up of one layer (the one next to the pulley) of chrome leather and an outside layer of oak-tanned leather.

There are cases where rubber belts, and others where camel's hair or fabric belts, give the best service. However, as such cases are exceedingly rare in machine-tool drives we will confine ourselves to the statement that rubber belts give good satisfaction where a great deal of cast-iron dust is present in the atmosphere, which is very apt to neutralize the grease in a leather belt. Camel's hair belting is particularly adapted to moist and hot places, and it is but seldom that machine tools are found in such locations.

Canvas belting, especially of the endless variety, is used for light and high-speed drives, such as for spindles of internal grinding machines. In such cases the belt should be impregnated with some gum or other substance which will produce an adhesive surface. Canvas belting has also been used for the drive of very light machinery and gives good satisfaction. It stretches little or not at all and consequently does not require to be taken up. Its chief drawback is that there is no good belt fastener in existence which meets the requirements of canvas belts, and that either the two ends of the belt must be stitched together in position or else the two loose ends must be turned over before a metallic fastener is introduced. This has the tendency to cause a thick portion in the belt where the joint is made. (See Fig. 31.) The loose flaps *A* and *A* are apt to cause trouble, and for that reason should be stitched to the main portion of the

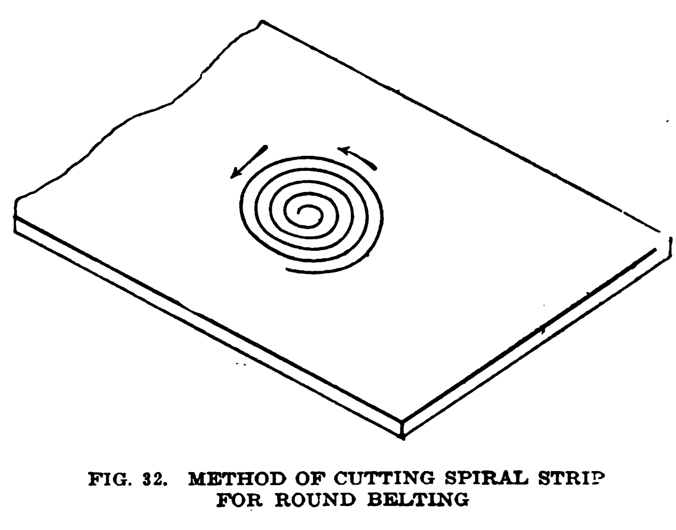
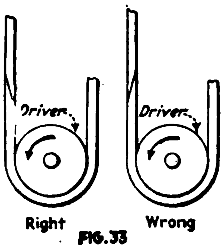


FIG. 32. METHOD OF CUTTING SPIRAL STRIP FOR ROUND BELTING

For the author's forthcoming book.

belt, as shown in the illustration. There is no reason why canvas belts should be recommended except on account of their cheapness, and whether such belts are



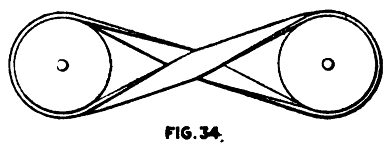


FIG. 33. RIGHT AND WRONG WAY OF APPLYING BELT. FIG. 34. CROSSED BELT

actually cheaper in the long run remains yet to be established.

Practically all belts are flat, but now and then a round belt is used. Such belts are only useful where the work is very light. Due to the way they are made, round belts lack uniformity. The strips of leather which are cemented together to make a flat belt are always cut lengthwise of the hide, or rather, center (that portion of the hide which should be used for belting). These strips do not all have the same qualities. Strength, stretch, flexibility, and adhesive quality vary with the distance of the strip from the center of the hide (line of backbone), and there is even a certain lack of uniformity in different parts of one strip, depending on whether that part is near the shoulder or near the tail. However, these differences are not excessive and, in any case, cannot be avoided.

On the other hand, a round belt is usually cut by going around the leather (center) in a spiral. (See Fig. 32.) Thus some parts of the belt are lengthwise and other parts crosswise of the hide. This causes a great lack of uniformity, making the crosswise parts very weak. As a result, a round belt stretches unduly and cannot be heavily loaded.

When three or more round belts are twisted together they are more reliable, but cause some trouble in making a proper joint or fastening. Such a belt may be useful when there is not sufficient room for a flat belt; the *grip* of a round belt in a V-rimmed pulley being much greater than that of a flat belt. As a whole, round belts should be avoided except for the very lightest kind of work.

Putting the belt in the machine is not the work of the designer, but as the machine is often blamed when the belt is at fault, it is right that we should mention those things which may cause trouble with an

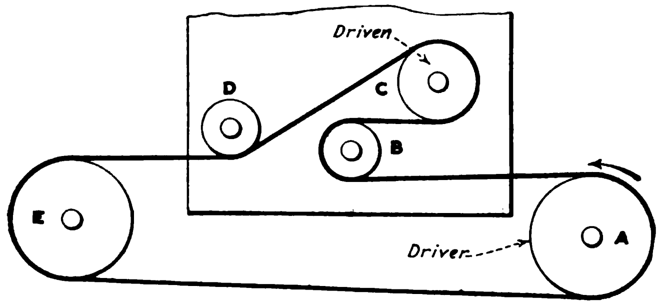


FIG. 35. BELT DRIVE WITH IDLE END PULLEY

otherwise well-designed machine. Among them are some qualities of the belt and also the manner of its installation.

After exhaustive research and many tests, the U. S. Steel Corporation has recently issued a set of specifications for oak-tanned leather belting, of which we give an extract. Many other points, besides those given here, are mentioned, but the fulfillment of these requirements can only be ascertained at the belt factory, while the points mentioned here can be examined at the factory of the user.

It is possible to treat a belt so as to increase its strength or reduce its stretch, or increase its flexibility or its adhesive qualities, but it is not possible to do all of these things at the same time; so that when limits are given for all of these qualities and a belt meets them all, it may be assumed that it will be of the desired quality.

E TRACT OF BELT SPECIFICITIONS

The thickness of a belt must not vary more than $\frac{1}{32}$ inch from the thinnest to the thickest portion of the belt.

The width of belt, 8 in. or less, must not vary more than $\frac{1}{16}$ in. Belts over 8 in. in width must be within $\frac{1}{8}$ inch.

The tensile strength of single belt must not be less than 700 lb. and for double belt not less than 1,400 lb. per inch of width.

The elongation shall be not less than fourteen per cent nor more than twenty-eight per cent at breaking load.

Laps must not be less than 3 in. long and must have a tensile strength of not less than 700 lb. per inch width for single and 1,400 lb. for double belt.

Animal oils or greases, only, shall be used for stuffing. The total stuffing must not be less than 8 per cent.

Other tests are prescribed, requiring apparatus not often found in the machine shop.

Of all questions asked about belting, no one is more common than this: Which side of the belt should be on the pulley? The flesh side appears to be much rougher than the hair side, and many people are inclined to think that this roughness will give better traction. As a matter of fact, the opposite is true. It is just because a rough surface gives little traction that a belt should be tested for so-called piping. Piping is the name for the wrinkles which appear on the surface of an inferior belt when it is sharply bent, and which do not entirely disappear when the belt is again straightened out. Not only does this piping diminish the traction but, because of this reduced tractive power, there is an additional amount of slippage which is apt to burn out the surface of the belt. As the hair side is the smoother, it should be placed on the pulley. A little thought would have answered the question even for one who does not know anything about belts. The fact that the beltmaker makes double belts with the hair side out on both sides shows that he intended the user to put the hair side on the pulley.

Belts are made of relatively short strips of leather, the length varying somewhat according to the length of the hide from which they are cut. They are seldom less than 45 in. or more than 54 in. long. The joints are made by tapering the leather down to a feather edge and cementing the two bevels together under pressure. However well such a lap or joint may be made there is danger of opening it up if we lay the belt flat on a table and push a block against the edge of the lap. This same danger exists when the belt is put on the pulley the wrong way. Fig. 33 shows the right and the wrong way of putting a belt on the pulley, so far as the laps are concerned. It might seem at first glance as if a crossed belt cannot lie right on both pulleys, but Fig. 34 shows that when it is laid properly for one pulley it must necessarily be right for the other.

The speed at which belting may be run and the horsepower it can transmit have been subjects for a great deal of controversy and are not yet entirely settled. As with all matters of engineering, different viewpoints may be held under different conditions. The writer has seen belts run at a speed of 7,500 ft. per minute and under a tension very much in excess of what is ordinarily considered good practice. Though under these conditions the belt did not have a long life, yet it was the best that could be done under the circumstances. Until quite recently, belt speeds higher than 3,000 ft. per minute were considered excessive. Nowadays speeds of 4,000 to 4,500 ft. per minute are considered permissible.

As to the allowable tension, from 40 to 45 lb. per inch width is good practice for single belts, and from 60 to 75 lb. for double belts. Much higher tensions are used but are not advisable for machine tools which are often called upon to perform a duty very much in excess of their rated capacity. If we mill a piece of steel with an average cut of ⅛ in. deep and we should meet a lump ¼ in. high, suddenly increasing the cut 200 per cent, we expect the belt t pull this cut, and for that reason it is necessary to figure on a relatively low tension when the machine is performing according to its rated capacity. Whenever possible a belt should be run horizontally with the slack side on top. The most unfavorable condition presents itself when we are compelled to run the belt vertically with the driving pulley at the top. The initial tension is reduced by the weight of the belt. Not only that, but when the machine is running one side will be stretched while the other side will be relaxed, so that the belt contact with the lower pulley is only a fraction of the theoretical amount. If we should not be able to run the belt horizontally, we should at least try to get as much horizontal distance as possible between machine and countershaft centers, and to have the slack side of the belt run at the top.

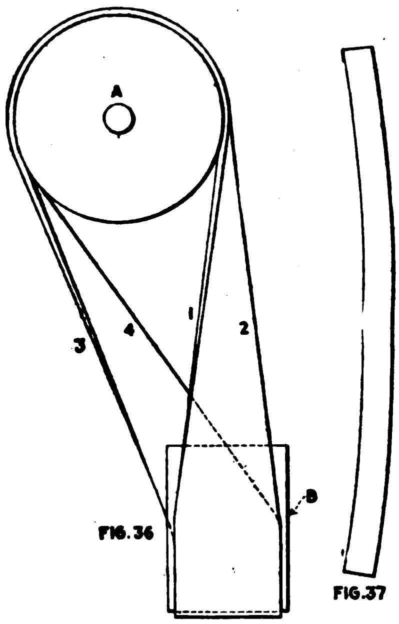


FIG. 36. QUARTER-TURN BELT WITH BAD FEATURE EXAGGERATED. FIG. 37. BOWED BELT FOR QUARTER TURN

A belt shows two kinds of stretch. That part of the belt which is under tension will stretch but the belt will resume its original length as soon as the tension is released; in other words, the belt shows elasticity. However, when a belt is run for a considerable period of time, and especially when it is new, it will gradually become longer and this lengthening of the belt is not a temporary affair but a permanent one. As a result of this permanent stretch, the initial tension of a belt gradually diminishes and it needs to be taken up. There are various ways in which this take up can be arranged for. In ordinary practice a piece is taken out of the belt, after which it is relaced. Where metallic belt fasteners are used, of the type of the Peerless lace, the following method for taking up belts in a factory is recommended:

All belts are made of two pieces—a long and a short piece. The short piece is about 8 to 10 in. in length. The millwright keeps in stock various pieces or patches of belt of lengths of 8—7½—7—6½—6 in., etc. When a belt with an 8-in. patch has become too long, he removes the rawhide pin, takes out a patch and substitutes another one, ½ in. shorter, or perhaps 1 in. shorter.

Where endless belts are used, or where metallic belt fasteners are not permissible, a belt tightener may be employed. Such a tightener can be arranged in various ways, such, for instance, as a pulley on a swinging arm pressing against the outside of the belt by means of a weight or spring, or which can be positively pushed up against the belt by means of slide rails and a screw. A peculiar use was made of such belt tighteners in the Mitchell planer drive, of which more later on.

We naturally visualize a belt drive as having a pulley at each end, one of them being the driver and the other the driven one. However, there are drives in which one of the end pulleys is really an idler. Such a drive is represented in Fig. 35, in which pulley *A* is the driver. Pulleys *B*, *C* and *D* belong to the machine and pulley *E* is an idler. Such an arrangement may be found, for instance, where the column of a floor boring or a milling machine moves along a bed and the mechanism on that column must be driven from the stationary pulley *A*. In such an arrangement either pulley *E* or *B* may be used for the take up.

The use of open and crossed belts is too well known to be discussed here in a general way. However, attention is called to the necessity of having a long center distance between the pulleys when using crossed belt. Preferably, the center distance should not be less than four times the mean diameter of the pulleys. For instance, two pulleys 24 and 16 in. in diameter, connected by a crossed belt, should have a center distance of not less than $4 \times \frac{24 + 16}{2} = 80$ in. This rule should not be considered as a law, but rather as a warning.

A very narrow belt could get along with a shorter distance; a wide belt might require a longer one. The main thing is to avoid appreciable twist where the driving and slack stretches of the belt pass each other. Unless this is taken care of there will be rubbing, with consequent excessive wear, and a tendency to open up the edges.

Crossed and Quarter-Turn Belts

Belts are crossed for two reasons: To give the driven pulley the proper direction, or to obtain a sufficient amount of belt contact when the pulleys differ much in diameter and their center-distance is short. As was mentioned before, crossed belts on short center-distances are not desirable, so that wherever possible the problem of providing belt contact should be solved some other way.

Quarter-turn belts should be avoided as much as possible. They are a source of trouble and the amount of trouble increases rapidly with increasing belt width and decreasing center-distance. The main sources of trouble are the lack of sufficient belt contact on the pulleys, and the fact that the two edges of the belt are

stretched unevenly. If we should measure the two edges of the belt after it has been placed around the pulleys, we would find that they are of unequal length.

In Fig. 36 a quarter-turn belt is shown with the objectionable conditions much exaggerated. The edges Nos. 1 and 2 of the belt are evidently of the same length, and just as clearly edges Nos. 3 and 4 must be of different lengths. It follows then, that in order to have the same tension in front and rear edges of the belt, we should make these edges of different lengths; in other words, the belt should be bowed as shown in Fig. 37. This is sometimes done, but a careful look at Fig. 36 will show that the problem cannot be solved that way. If the belt is made as in Fig. 37 the edges Nos. 1 and 2 will be under different tensions, so that we have merely displaced our trouble. However, it is possible to diminish the amount of this trouble somewhat in this manner. The proper way to overcome it as much as possible is to make the center-distance large and guide the belt by idler pulleys.

(Continued in next week's issue.)

How Surface Affects Measurement With Plug and Ring Gages

By Frank C. Hudson

One old shop conundrum, on which thousands of cubic feet of vocalized air (heated and otherwise), has been expended, has been answered. Can a 2-in. plug be inserted in a 2-in. ring? Yes—and then some—to the tune of about a half thousandth.

It seems foolish of course, even to intimate that a hardened plug measuring 2 in. can be put in a hardened ring measuring 1.995 in. without a sledge hammer or an arbor press. But after you watch John Bath, of Worcester, Mass., show you what can be done with bare hands you cannot help wondering just what we have been doing with plugs and gages during the past twenty years. One thing is certain, however, you see beyond question that the condition of the surface being measured affects the apparent size as indicated by a plug and ring.

Take a ring and a plug which will barely enter when dry. Clean them both carefully. Bath has found a little soap and water the best. Wipe them perfectly dry. Put on a little castor oil, or other good oil, well distributed and see how easily the plug slips into the ring. It will probably slide down of its own weight.

Wipe off the oil each side of the ring, and clean it thoroughly, move the ring and repeat the cleaning. When you get it clean the ring is liable to stay right where it is unless you use force. And yet we naturally assume that the oil film occupies some space.

Now take a 2-in. plug and a ring with the hole about a half-thousandth small. Oil them both well and see if you can't push them together without undue pressure. Why? Does the ring stretch or the plug compress? Isn't it one or the other? And what is its bearing on inspecting work with plug and ring gages?

The fact that there is a distinct difference between the apparent diameter with the surface dry or oiled, shows that the condition of the surface does make a difference. Even breathing on the perfectly dry surface makes a little difference. Knowing this, isn't it reasonable to question the accuracy we think we are getting with plug and ring gages? Isn't it especially necessary to have the surfaces of pieces being inspected in an exactly similar condition to compare them?

The Passing of a Pioneer

AN APPRECIATION OF THE WORK OF WILLIAM GLEASON

It is to be regretted that with the passing of William Gleason, founder of the Gleason Works, Rochester, N. Y., we have lost one of the last of the pioneers in the machine-tool business of this country. Away back in 1865 William Gleason founded the nucleus of what has grown to be the Gleason Works, with its extensive buildings and its world-wide reputation.

Born in Tipperary, Ireland, in 1836, William Gleason came to this country in 1851, at the age of 15, and started to work for Asa R. Swift, of Rochester. His apprenticeship was served there and in the shop of I. Angell & Sons. During the Civil War he went to Colt's Armory in Hartford, Conn., but went back to Rochester in 1865 and formed a partnership with John Connel and James S. Graham to manufacture machine tools and woodworking machinery. The fact that this partnership was dissolved in 1873 and that William Gleason perfected his first bevel gear planer in that year, has made us lose sight of his earlier achievements in the machine-tool field.

Change of Firm

With the dissolving of the firm of Connel, Gleason & Graham, William Gleason went with the Kidd Iron Works in 1873, taking it over two years later. The Kidd Iron Works was located down in the old power section of Rochester known as Brown's Race because of the mill race which supplied power to the shops in this vicinity. The business grew steadily, all energies being concentrated on the development of machines for cutting bevel gears more accurately and more economically than had ever been done before. Additions were made to the plant, but in 1910 it became necessary to abandon the old site and the plant was moved out to the present location on University Avenue. Great care was given to the architecture of the buildings and they present a pleasing appearance without being ornate or garish in any way. They may still be considered as models of modern shop buildings.

Phenomenal Growth of the Business

The growth of the shop from one of six men to a plant occupying twenty acres and employing 1,700 men during the rush of work during the war was very gratifying to its founder, but he liked to talk of the days when he built lathes and planers, some of which are still in operation. The memories of his older achievements, however, did not prevent his being keenly interested in the development of the Gleason gear planer. This machine which was almost entirely developed by his two sons James E. and Andrew Gleason has a worldwide reputation for the production of accurate bevel gears.

Active almost to the last, William Gleason never lost touch with his older employees, a few of whom had been with him for over 45 years. And during an illness, about a year ago when business was very bad, he was anxious lest some of the older and most deserving men should suffer in any way. Always genial, always fair in his dealings, he will long be remembered as a shining light in the machine-tool industry. He leaves a widow by a second marriage, two sons, James E. and Andrew, and two daughters Kate and Eleanor.

Decimal Series for Tap Drills

By A. J. Schwartz

A firm manufacturing large quantities of screw thread products for the U. S. Government, found it impossible to obtain commercial size drills that would be entirely satisfactory for use in drilling all the holes to be tapped in accordance with the report of the National Screw Thread Commission, even though advantage had been taken of the permitted tolerance. This firm had to resort to special drills, or to boring some of the holes in order to meet the requirements of the limits of tolerance specified in the report, as the law authorizing the commission made it mandatory upon the U. S. Government to use the uniform screw thread products made in agreement with the report of the commission.

PROPOSED TABLE OF DECIMAL TAP DRILLS FOR CLASS II-B MEDIUM FIT THREADS

Coarse Thread Series						Fine Thread Series					
Size	Thds.	Tapped Hole Minor Diam.		Drill Size	Stock Drills	Size	Thds.	Tapped Hole Minor Diam.		Drill Size	Stock Drills
		Min.	Max.					Min.	Max.		
0	..	......	......	.....	....	0	80	0.0465	0.0478	0.047	1.2mm.
1	64	0.0561	0.0578	0.057	....	1	72	0.0580	0.0595	0.059	1.5mm.
2	56	0.0667	0.0686	0.067	....	2	64	0.0691	0.0708	0.070	No. 50
3	48	0.0764	0.0787	0.077	5/64	3	56	0.0797	0.0816	0.080	No. 46
4	40	0.0849	0.0876	0.085	2.2mm.	4	48	0.0894	0.0917	0.090	....
5	40	0.0979	0.1006	0.100	No. 39	5	44	0.1004	0.1029	0.102	2.6mm.
6	32	0.1042	0.1076	0.105	2.7mm.	6	40	0.1109	0.1136	0.113	No. 33
8	32	0.1302	0.1336	0.130	....	8	36	0.1339	0.1369	0.135	No. 29
10	24	0.1449	0.1494	0.145	3.75mm.	10	32	0.1562	0.1596	0.159	No. 21
12	24	0.1709	0.1754	0.170	4.4mm.	12	28	0.1773	0.1812	0.180	No. 15
1/4	20	0.1959	0.2013	0.200	No. 8	1/4	28	0.2113	0.2152	0.215	No. 3
5/16	18	0.2524	0.2584	0.255	6.5mm.	5/16	24	0.2674	0.2719	0.270	....
3/8	16	0.2073	0.3141	0.310	7.9mm.	3/8	24	0.3299	0.3314	0.330	No. Q
7/16	14	0.3602	0.3679	0.365	9.25mm.	7/16	20	0.3834	0.3888	0.385	No. W
1/2	13	0.4167	0.4251	0.420	27/64	1/2	20	0.4459	0.4513	0.450	....
9/16	12	0.4723	0.4813	0.480	....	9/16	18	0.5024	0.5083	0.505	....
5/8	11	0.5266	0.5364	0.530	13.5mm.	5/8	18	0.5649	0.5709	0.570	....
3/4	10	0.6417	0.6526	0.650	....	3/4	16	0.6823	0.6891	0.685	11/16
7/8	9	0.7547	0.7667	0.760	....	7/8	14	0.7977	0.8054	0.800	....
1.0	8	0.8647	0.8782	0.875	7/8	1.0	14	0.9227	0.9304	0.925	....
1 1/8	7	0.9704	0.9858	0.980	....	1 1/8	12	1.0348	1.0438	1.040	....
1 1/4	7	1.0954	1.1108	1.100	28mm.	1 1/4	12	1.1598	1.1688	1.165	....
1 1/2	6	1.3196	1.3376	1.330	1 21/64	1 1/2	12	1.4098	1.4188	1.415	....
1 3/4	5	1.5335	1.5551	1.550	....	1 3/4	12	1.6598	1.6688	1.665	....
2	4 1/2	1.7594	1.7835	1.780	45mm.	2	12	1.9098	1.9188	1.915	....

In order that there may be a uniformity in drill sizes, the plea is made for a new system or series of tap drills that will be suitable for the minimum diameter of the hole given in the tables of the report of the commission. We already have established the following systems for drills, viz., numbered sizes and letter sizes, the actual diameter of which are not known offhand, nor can be remembered by the average mechanic. Then we have the fractional system of drills, which when the size is in 64ths, is just about as vague to the same class of mechanics. While during the World War we adopted the millimeter series, that series requires interpretation if conversion is made to decimals. Decimal drills are made and kept in stock by some firms, but these sizes are as a general rule ordered as specials.

If all the foregoing sizes were arranged in a table according to a decimal series, it would show that drill manufacturers are obliged to carry in stock over 550 different so called standard drills, from No. 0 to 3½ in. varying in some instances between sizes by only 0.0002, 0,0003 and 0.0004 in. These differences correspond to toolmaker's gage tolerance, and it is thought that such sizes should not be required from drill manufacturers. There are carried in stock by some firms, as many as fifteen sizes of commercial drills between 0.75 and 0.875 inch.

An appeal is made to designers and draftsmen to adopt a table of sizes of the different drill series and, preferably, adopt the decimal size series so that the number and letter series will gradually be forgotten and the great quantity of sizes reduced to a minimum, thereby permitting the jobber to keep in stock a complete set of one standard drill for tapped holes. Of course, we will always have with us the metric and fractional series, and some day it is the hope that they will be superseded by the standard uniform decimal series. The accompanying table is submitted for a three decimal-size drill series, to be used for the screw thread products specified in the report of the commission. These sizes have not, however, been given a practical test.

It will be noted that some of the drill sizes exceed the recommended working-gage tolerance, but the sizes are all within the tolerance specified in the report, and at the same time, there is ample tolerance and allowance for wear permitted for the manufacture of the drills. The commission report having adopted the minimum hole as standard, reduces the system to the use of only one series of forty-nine drills for both its coarse and fine screw threads. As the minimum hole is expressed in decimals, the drill series should also be expressed in decimals. These drills should be marked with the normal size of the screw, the threads per inch and the nominal size of the drill. Each set of drills to be labeled "National Standard Screw-Thread Tap Drills." These sets to be made up in three units: (1) Drills for 1⅛ to 3 in. inclusive; (2) 1 to ¼ in. and (3) Nos. 12 to 0.

The drill manufacturers may substitute some of their present stocks of standard drills for the sizes given in the table, if the drills fall within the tolerance of the tapped hole, but the drills should be marked as noted above. The sizes of the drills do not vary by a uniform constant, but it will be noticed that with the exception of the first few sizes, the decimal size drills end in a zero or a five.

A little investigation will show that there is a very large amount of money expended for broken drills and taps and spoiled work, due solely to the lack of knowledge regarding drill and tap performances on the part of all concerned. The investigation of drill sizes for screw thread work is very urgently needed at the present time, and in particular the standardization of drill sizes for the National Screw Thread System for both the coarse and fine thread series. To quote from a paragraph given in an advertisement of a large drill manufacturer "The National Screw Thread System is a development of the manufacturing hell arising during the World War, and at that time the obvious lack of standardization in thread tolerance resulted in untold delay, grief, misunderstanding and tremendous expense." Our present knowledge regarding the drill question is about in the same condition as it was of screw threads during the World War. A practical investigation should be made as to the drill sizes to be used for the holes recommended by the commission, as chance and haphazard methods used in drilling are very expensive propositions.

It is well known that accurately drilled holes insure more perfect threads and consequently make the parts fit better and closer when screwed together, thus assuring rigidity and reliability; and that a complete knowledge on the use of drills to get the most out of them and the confidence in such knowledge that the drills used are cutting within the prescribed accuracy, will greatly increase production and with a corresponding decrease in the cost.

Ideas from Practical Men

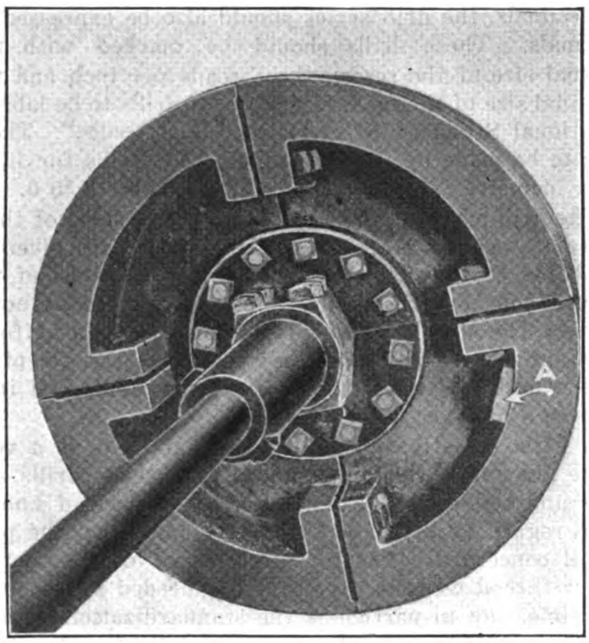
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Building a Flywheel Under Difficulties

By R. Grant

We had occasion to make a flywheel of about 3,000 lb. weight, 3 ft. in diameter and with a rim 13 in. wide by 4 in. thick. As our largest turning equipment was a 16-in. Hendey lathe we were somewhat handicapped, and were obliged to resort to building up the wheel as shown in the cut.

The hubs and flanges, made in halves, were as large as the lathe would swing and were completed by the usual machining operations. A pattern was made to cast the rim in quarter sections and our machine equipment allowed us to drill all the bolt holes by power, but this was the extent of the machine work possible on the web and rim.



FLYWHEEL BUILT BY HAND

With the rim sections bolted together, a seat was made on one side of the web for the flange by chipping, using a surface gage and checking to the rim to get this face true. To chip the opposite side of the web the wheel was laid on one of the hubs so that the surface of the web already chipped rested on the finished face of the hub. The hub was held centrally by pins in the bolt holes. A short shaft was placed through the hub and web and the second hub put on the projecting end of the shaft. The finished face of this second hub was used as a surface plate to indicate the truth of the chipping as the work progressed.

Notwithstanding the crude method of producing it, the completed wheel needed only a small block, shown at *A*, to balance it.

Hooks for Handling Locomotive Tires

By J. Robert Phelps

The illustrations herewith show a pair of hooks used in the Atchison, Topeka & Santa Fe shops at San Bernardino, Cal., for handling locomotive tires. In Fig. 1 the hooks are shown by themselves and in Fig. 2 their application to a tire is illustrated.

FIG. 1. THE TIRE HOOKS

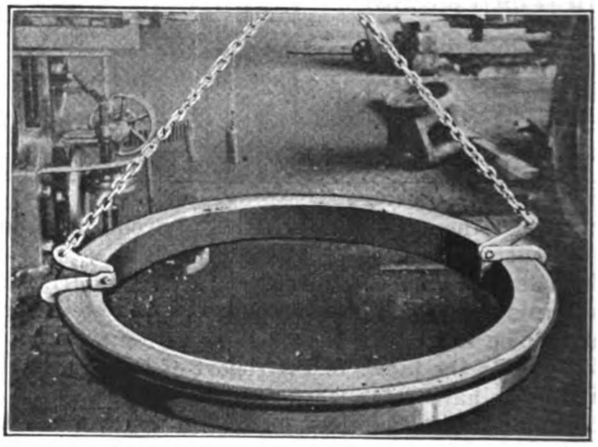


FIG. 2. TIRE SUSPENDED BY HOOKS

With these hooks tires can be picked up either when lying flat on the floor or standing on edge, and delivered where wanted.

Plan of Maintenance for Spline Broaches

By George E. Hodges

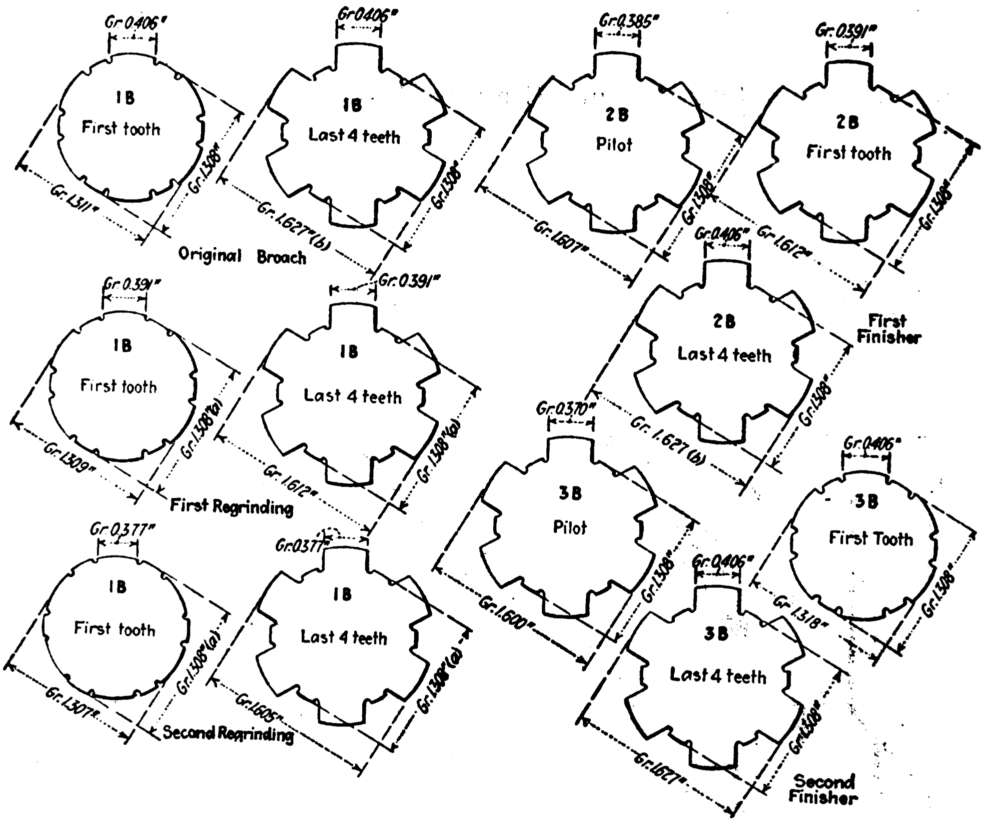
The chief requisite of a spline broach is that it shall cut a clean, smooth, accurate hole. Because of the nature of the material upon which such broaches are ordinarily used and the severity of the service, such a tool is comparatively short lived and the tool cost of the operation is, therefore, relatively high. The purpose of this article is to show how the maintenance cost of spline broaches may be reduced to a minimum.

The width of the spline is the most arbitrary dimension, the size that must be maintained within the closest limits, for in a well designed job there should

be clearance between both the large and the small diameters of the shafts and their respective seats so that the sides of the several splines would bear the brunt of the work.

To maintain the necessary accuracy, high-priced broaching tools are used and, for the reason that the facilities at hand for regrinding them are usually inadequate, the tools are kept in service just as long as possible. The moment the resultant hole shows signs of having reached the low limit, they are scrapped.

It is scarcely advisable to grind broaches on the faces of the teeth. Few men can, or will, do this without changing the rake angles or drawing the temper. Rather should the teeth be honed on top with an oil-stone to restore the cutting edge. When the broach becomes too small to produce holes that will pass the gages, the plan here outlined may be employed. Though but one size of broach is shown in the sketch, the plan may be adapted to other sizes.



REGRINDING SPLINE BROACHES

The broach selected to demonstrate the plan is of a size used extensively for popular priced transmissions on nickel-steel gear blanks presenting a 2-in. length of hole. Sections 1B are shown reground twice, although if thought advisable they may be reground twice more by using the 3B type of finisher and making necessary allowances on the pilot.

The original broach is used singly until it wears below size, when it may be reground by the following method: The broach is first straightened as accurately as possible, and its outer diameter ground and the teeth relieved on a plain cylindrical grinding machine. It is then mounted upon a planer type grinding machine and the splines ground, after touching up the body of the tool (marked *a*) to bring it concentric with the outer circumference.

The splines may have some tolerance, but the finisher 2B should enter the work easily. This finisher is a short tool and cuts on the tops as well as on the sides of the splines. It has little more to do than to clean up the hole and if it is properly made should hold its size well.

When the reground broach begins to cut small it shoul again be reground to the sizes shown in the sketch marked "second regrinding." When placed in production this time the finisher shouid be of the same length as the stocking broach, and for this reason. The finisher may, by regrinding, be brought to the original size of the 1B section if in designing the set the dimension marked *b* is kept to the maximum on the finisher and to the minimum on the 1B section. This would affect only the clearance between the outer circle of the shaft and its seat.

It will be noted that the figures given on the sketch indicate not more than 0.015 in. reduction on any of the dimensions. If more than this amount seems to be needed the broach is not straight and should be corrected before starting to regrind.

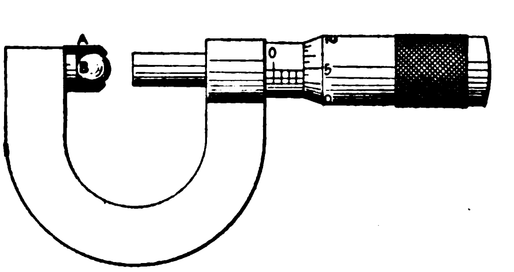
The cost of any of these regrinding operations should not exceed $15. Of course, a new tool is taken to start with and the two finishers are new. The 2B is the least expensive to make as it is shorter, and with the work it is called upon to do should stand up longer than the 1B. Although the regrinding calls for two operations, the saving in tool cost will more than repay the labor and machine cost.

The 3B type of finisher will outlast any of the other broaches and, when worn, may be reground to the 1B type and be as good as a new broach of that type.

A Micrometer Attachment

By Theodore C. Humphreys

The attachment shown in the sketch may be found useful in measuring the thickness of the wall of tubing, and other similar jobs. *B* is a hardened ball 0.25 in.



MICROMETER ATTACHMENT

in diameter. *A* is a tube with a small shoulder to prevent the ball from falling out, but allowing it to extend through and rest against the anvil of the

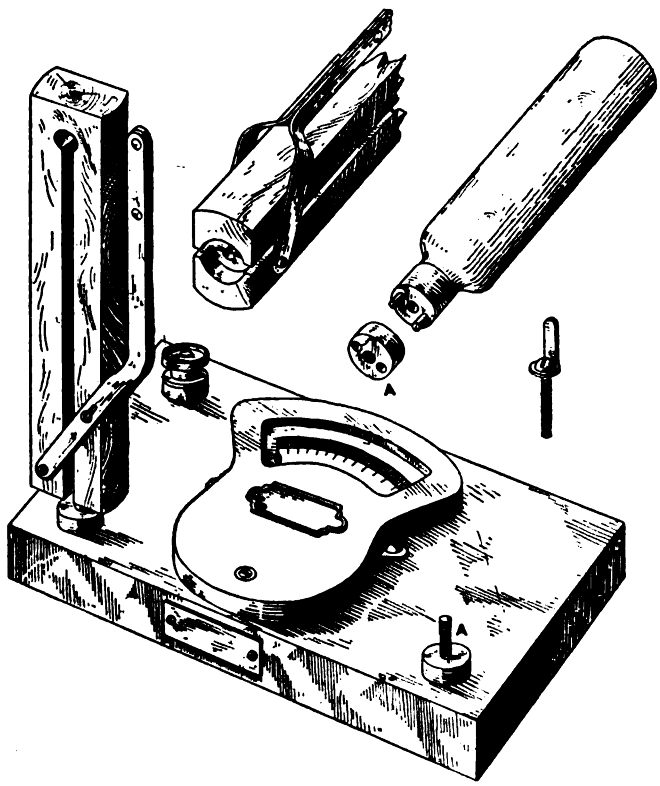
micrometer. The end of the tube is slightly spun over to hold the ball in place after it is inserted.

The tube should fit snugly on the anvil so that it will hold and yet be readily removed when not in use. In measuring, the diameter of the ball should be subtracted from the actual micrometer reading.

Tool for Assembling Polished Binding Posts

By Charles H. Willey

In assembling certain electrical instruments that were mounted on polished mahogany bases, the nickeled binding posts, or terminals, were run on the screw with a spanner wrench having two pins to match corresponding holes in the binding post. The work of drilling these two holes in many thousand pieces was costly and



FRICTION WRENCH FOR NICKELED BINDING POSTS

the shop foreman eliminated it by making up several tools of hardwood, as shown in the sketch.

They were simple to make and were used as follows: The piece *A* was run on the screw with the fingers, being tapped an easy fit, then this wrench was applied and by gripping the lever, closed tightly on the piece. It was then turned a little and released, closed and again turned until the nut was tight.

Enlarging Gas-Engine Pistons

By Robert Tait

On page 638 of *American Machinist*, Ivan C. Beach gives his experience in expanding pistons of automobile engines by heating them to a red heat and allowing them to cool under a weight. In compliance with the Editor's request for data from readers I submit our experience.

We have been making automotive parts and doing general machine work for garages for a number of years and, of course, the work in this line which comes to us is generally accompanied by a request to "hurry it up" as the owner simply "has to have it right away," etc., and in the interest of universal peace we have enlarged, or attempted to enlarge, a good many pistons by the heat method.

There is nothing definite about the job. For instance: A car which has been quite popular in this territory has a $4\frac{1}{8}$-in. bore and another has a $3\frac{3}{8}$-in. bore. Repeated attempts to expand the $4\frac{1}{8}$-in. pistons always met with flat failure, the expansion never being sufficient to allow of refinishing the pistons, while on the other hand the $3\frac{3}{8}$-in. pistons, while containing much less iron, would always expand approximately 0.015 in. which would give stock enough to permit regrinding to several thousandths oversize.

Some piston manufacturers heat-treat their product as a means of relieving foundry stresses while others allow the rough castings to age before being finished to accomplish the result, and our supposition is that those pistons which have been heat-treated at the factory will not expand to any great extent, while those which have not been so treated, will expand.

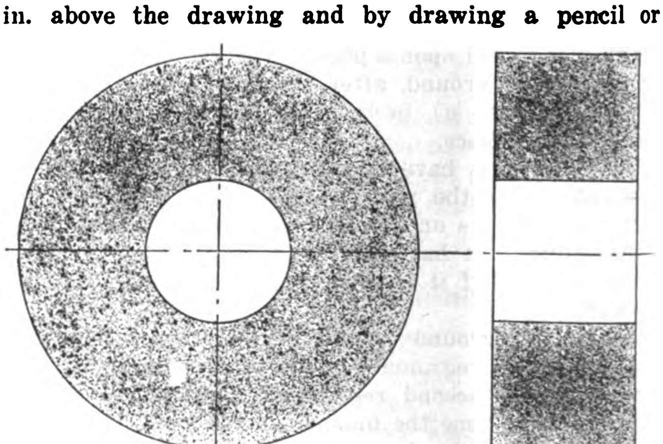
Weights, in our experience, have never helped. If enough force is exerted in this way there is a tendency to make the piston barrel shaped, but without any appreciable increase in expansion at the open end of the skirt. The most important point in this operation is the heat, which should be as high as possible without scaling the iron.

As regards the wearing qualities we have never had any complaints on this score and doubt if the slight difference enlarging causes in the structure of the iron would effect its wearing qualities. At best it is a makeshift job, rather in the nature of a court of last resort to which we have to appeal at times.

Stippling Drawings

By E. H. Bruce

In stippling drawings of abrasive wheels or stone work, time can be saved by covering all parts of the drawing, except that to be stippled, with a paper stencil which should be weighted down. Then take a brush such as a tooth or typewriter brush and dip it in drawing ink. Hold the brush at an angle about 4 in. above the drawing and by drawing a pencil or


DRAWING OF ABRASIVE WHEEL STIPPLED BY METHOD DESCRIBED ABOVE

stiff wire over the bristles, the ink can be directed to and splashed over the exposed parts of the drawing.

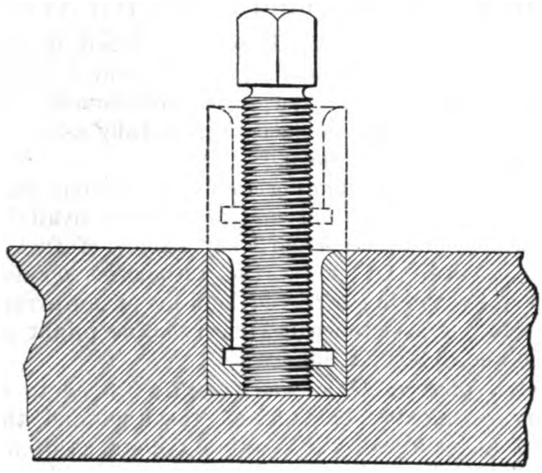
The accompanying illustration was made by this method. By a little care the ink can be distributed so that flat surfaces may appear convex or concave.

Removing a Bushing from a Blind Hole

By Art Weiss

On page 677 of *American Machinist*, W. H. Storey shows a method of extracting a bushing from a blind hole that is somewhat of an improvement over that first method suggested by C. Reimschissel.

Mr. Storey's method also requires some previous



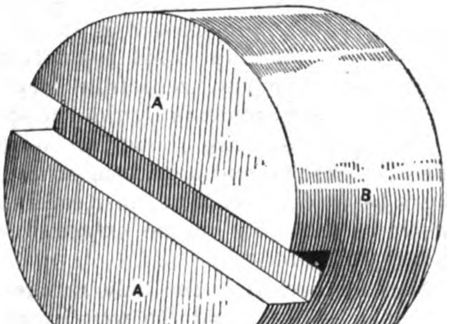
BUSHING FOR A BLIND HOLE

preparation and, like all the others, involves hunting up washers, etc., when the bushing is to be removed. Therefore, why not make the bushing as shown in the accompanying sketch and avoid having to hunt up anything with which to extract it? For years I have made bushings in this way and when they are to be taken out all that is necessary is to take a setscrew of the proper size and length, insert it in the tapped hole, and the bushing may be lifted out without further trouble.

A Kink in Local Hardening

By John F. Shunney

Having fifty pieces, like the one shown in the sketch, to be hardened upon the face *A*, we tried holding the heated pieces by means of tongs so that the face to be hardened would just touch the surface of the water. We were unable to get satisfactory results in this way, however, as the hardening would extend up the sides at *B*, where we did not want the pieces to be hard. We secured a plate of cast iron of suitable size



PIECES TO BE LOCALLY HARDENED

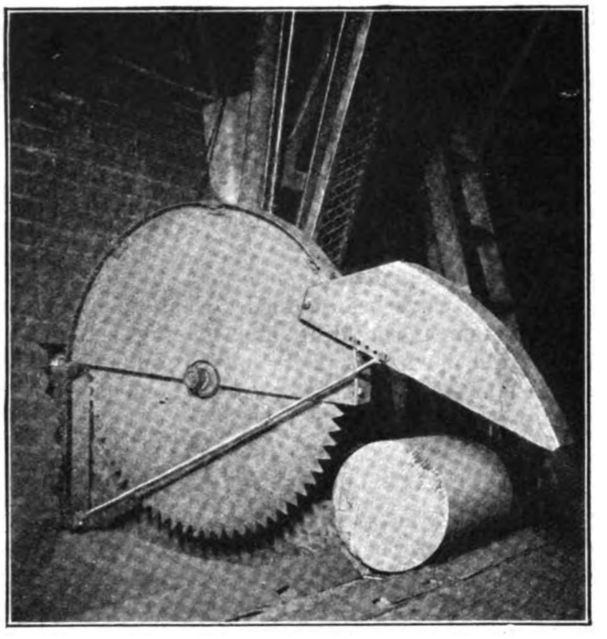
and about 1 in. thick and cut narrow, closely-spaced grooves across it at right-angles so as to present a checkered surface. This plate we suspended in the hardening tank with the upper, or checked, face about even with the surface of the water so that the water would flow through the grooves but would not stand to any appreciable depth upon the plate.

By setting the pieces on this plate as fast as they were heated we were able to harden the whole batch very quickly and in a satisfactory manner. The material was carbonized machinery steel.

Dangerous Swing Saw Guarded by Novel Device

By George F. Paul

A novel safeguard for a swing saw has been developed at one of the big factories at Niagara Falls, N. Y. An automatic guard is provided at the front of the saw and



GUARD FOR A SWING SAW

is actuated by a rod. An automatic latch prevents the saw from coming forward while the workman is placing material in position. A stop limits the backward movement of the saw. On the saw frame is mounted a light that serves to illuminate the cutting edge. The belt is guarded by the wire mesh in front and the frames on the sides.

Recommended Practice for Heat-Treatment of Carbon Steel Castings

The report of Committee A-4 of the American Society for Testing Materials has been prepared and copies are ready for distribution. The report will be presented at the annual meeting of the society in Atlantic City on June 26 to 30. Reprints have been distributed to the members with a view of stimulating discussion at the meeting. H. M. Boylston is chairman of the committee.

Sub-committees have been at work on the following subjects: Desirability of annealing iron chain at intervals; heat-treatment of rolled and forged carbon steel; heat-treatment of alloy steels; and the heat-treatment of carbon-steel castings.

On the last subject the committee has recommended that the castings be heated slowly and uniformly to temperatures varying with the carbon content of the steel. The recommendations are intended solely for guidance and are not to be construed as specifications of the society.

Copies of the paper can be obtained from the society, and criticisms are invited.

Editorial

Scientific Management

ON OTHER pages of this issue we present an Englishman's views on scientific management as related to British shops.

It would seem that this article carries under its surface more of a message to managers of industrial plants—here as well as abroad—than will be apparent on casual reading. The author emphasizes the fact that methods and systems must be fitted to the shops in which they are to be used. Some of us know to our sorrow that costly mistakes have been made in trying to adopt a particular system by swallowing it "Horse, foot and dragoons."

Scientific management is not new, however recently the name may have been coined. Noah followed a well defined system in building and loading the ark, but where he fell down was in its navigation. 'Tis true he finally made port, but it was not one of his own choosing.

Where Are the Good Machinists?

ONCE more the words of the economic prophets seem likely to be fulfilled. A shortage of skilled labor is in sight if it is not already upon us. It is not universal as yet, but it is spreading as the tide of increasing business rises.

As a result the machinery builder is soon going to be face to face with the problem of how to find the kind of men he needs to keep his shop going. When the first ripples of the business tide reach his door he is certain to find that the best men have been washed into the employ of his customers and he must bid high to get them.

Ample warning of the imminence of skilled labor scarcity has been given to members of the National Machine Tool Builders' Association by their general manager. The machine tool men are always the ones hardest hit by this ever-recurring condition by reason of the fact that their orders are about the last to pick up of any group in the manufacturing cycle. Their situation is a particularly difficult one because the nature of their product requires the highest type of machinists.

In the past they have had the very doubtful pleasure of seeing their best men and most promising apprentices attracted to other industries, notably the automobile industry, by wages much higher than they could afford to pay. Training machinists for the other fellow is not a very profitable undertaking for the man who does the training even though the industry as a whole gains thereby.

However, under existing circumstances the best way to have good men coming along seems to be to have apprentices in a carefully planned course in your plant and so to instill in them a spirit of loyalty to the company that they will stick with you even when temporary higher wages offer a tempting lure to other fields. Some companies have done this with marked success and they will be in an enviable position when business gets into full swing.

How the Army Could Help Civil Aviation

ONE of the recognized needs of civil aviation is landing fields where fuel, oil, etc., can be obtained. We are constantly urging the establishment of more fields and yet we are not utilizing as fully as we should the fields we already have.

There are army landing fields in various parts of the country and yet not one of them is available for civil use, even for an emergency supply of fuel, oil or other supplies. Of course the authorities do not prevent a pilot making a forced landing on an army field, but so far as assistance is concerned, he might as well land in the desert of Sahara.

A civil pilot in Ohio was recently forced to seek a landing owing to shortage of gasoline, and thought himself lucky to be within gliding distance of a large army field. But after landing he was unable to buy, beg or borrow a drop of fuel. Not through any lack of courtesy or consideration on the part of the officers in charge, but because the army regulations forbade it. He had to walk two miles to a town and hire a truck to bring him a supply of fuel.

It hardly seems possible that there can be any justification for such a ruling in times of peace. Everyone recognizes that the more civil aviators there are the better for an army in time of war.

Eternal Vigilance Is the Price of Eyesight

A RECENT bulletin issued by the Eyesight Conservation Council gives extracts from the study of Waste in Industry, under the auspices of the Federated American Engineering Societies. It points out the loss to industry still resulting from preventable accidents. In Pennsylvania alone in one year (1920) eighteen persons lost both eyes and 652 lost one eye, with a total of $826,724 as the cost in compensation only. The total for the industrially blinded is given at 15,000, or 13.5 per cent of the total blind population. The American Locomotive Company reports a great reduction in the number of eye accidents by the use of safety goggles.

Proper glasses are shown to be very necessary for the best results and a careful study of the conditions must be made. Without this, safety glasses may very easily be annoying in the extreme and not always an element of safety.

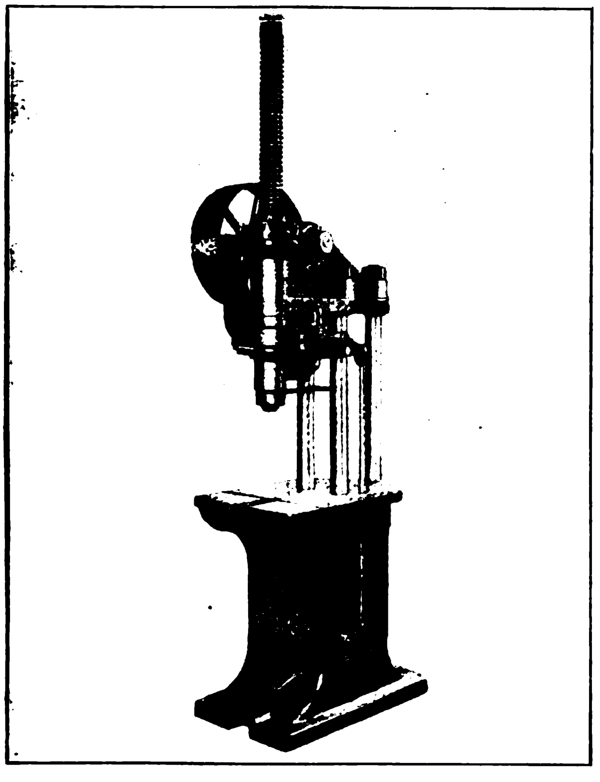
Nor are accidents the only things to be considered. The kind of light and the way in which it strikes the eyes of the worker are both important. This involves the proper location of machines with regard to the light, both natural and artificial.

The great need is for campaigns in the smaller plants, especially as the cost per man for bringing the light up to a good standard is usually greater than in larger plants. The cost of providing adequate illumination for the whole industry is given as being one-half of one per cent of the wages paid. This is a small sum as compared to the loss to industry, or to the possible burden on the community and the resulting suffering on the part of the individual.

Shop Equipment News

General Manufacturing Co. Flexible Power Press

The General Manufacturing Co., 255 Meldrum Ave., Detroit, Mich., has just placed on the market a flexible power press similar in principle to that described on



"GENERAL" FLEXIBLE POWER PRESS

page 117 of *American Machinist.* This machine, as the name implies, is flexible at the will of the operator as to the pressure applied, which may vary from a few pounds up to 8 tons. Because of this control feature, the press is especially adapted for straightening, for pressing in bushings, or for assembling parts having press fits. Having a stroke of 9 in., it may also be used advantageously for push broaching and similar jobs because of its adaptability.

The press, shown in the accompanying illustration, is a three-post machine, mounted on a base with the table top 30 in. from the floor. Two of the posts are in tension, the third post is under compression. The ram is threaded with a long lead Acme thread and runs through a nut 4 in. in length, which nut is also the brake drum

Power is applied to the pulley by the belt; thence through a worm gear and spline key, driving the ram at constant speed in one direction. The nut turns with the ram until pressure is applied on the foot pedal. This pressure closes the asbestos-lined brake band on the nut and the ram passes down immediately through the latter until the pressure on the foot pedal is released, or until the pressure applied by the ram on the work equalizes the pressure applied on the foot pedal. The return stroke is obtained by a spring around the top of the ram, which raises the ram immediately after operation to its up, or normal, position, the nut turning freely on the ram as it rises.

The height between the end of the ram and the table in this machine is 12 in. Any other dimension, however, may be secured by using a different set of columns and length of control rod. The speed of travel of the ram depends entirely on the speed at which the pulley is run. For example, with the pulley running at 300 r.p.m., the ram travel will be 150 in. per minute. The end thrust is taken on a ball bearing between the nut and main casting.

Nicholls Portable Duplex Molding Machines

The William H. Nicholls Co., Inc., 2 College Place, Brooklyn, N. Y., has just placed on the market two models of portable, duplex molding machines. The machines are intended for use on long, narrow floors, and they can be moved along so as to minimize the distance which the sand, flasks and molds have to be carried.

The Model 14-42 machine, shown in Fig. 1, is intended principally for making copes and drags simultaneously. There are two adjustable screw heads, so that the height can be adjusted for different depths of cope and drag. In many cases the cope can be made on the split pattern plate attached to the jolt head, and the drag made on a right-hand side and rolled over before

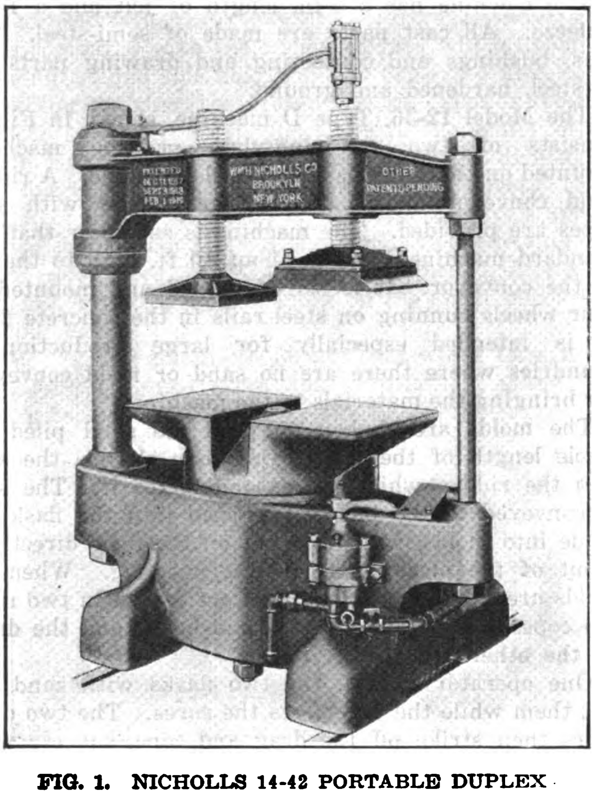


FIG. 1. NICHOLLS 14-42 PORTABLE DUPLEX MOLDING MACHINE

squeezing. The pattern can be drawn with the electromagnetic drawing device and both halves squeezed at the same time.

The squeeze is made on the up-stroke of the piston, and the draw on the magnetic side is made while the mold is being withdrawn by gravity on the return stroke of the piston. The valve is placed low and has a horizontal handle. The position of the valve permits easy and quick operation in starting the jolting.

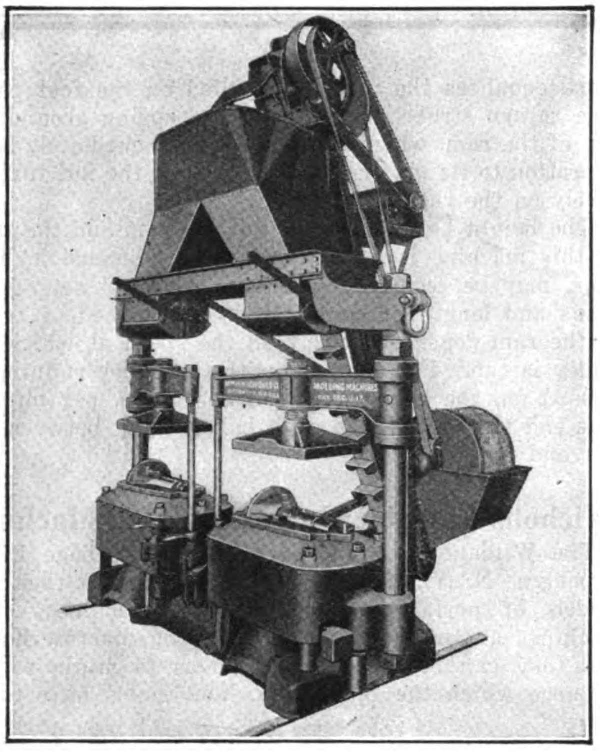


FIG. 2. NICHOLLS 12-36 TYPE D DUPLEX SELF-CONTAINED MOLDING MACHINE

The machine has a 6-in. length of jolt and a 14-in. squeeze. All cast parts are made of semi-steel. The pins, bushings and contacting and drawing parts are of steel, hardened and ground.

The Model 12-36, Type D machine, shown in Fig. 2, consists of two stripping-plate molding machines mounted on the same base and made portable. A riddle, sand conveyor and a double boot hopper with sand gates are provided. The machine is set lower than the standard machines, and is about 10 ft. high to the top of the conveyor. It is self-contained and mounted on four wheels running on steel rails in the concrete floor. It is intended especially for large production in foundries where there are no sand or mold conveyors for bringing the materials to the machine.

The molds are shaken out and the sand piled the whole length of the floor. One man shovels the sand into the riddle, which cleans and mixes it. The sand is conveyed to the hopper, dropped into the flask and made into molds, which are set on the floor directly in front of the machine as it travels along. When the molds are shaken out, the flasks are placed in two rows, the copes on one side of the sand heaps and the drags on the other.

One operator can fill the two flasks with sand and jolt them while the other sets the cores. The two operators then strike off the drag and cope, squeeze them and help one another to put the molds on the floor. This machine is complete, and it not only mixes and conveys the sand into the mold, but gives a strong jolting action. The combination squeeze and drawing action semi-automatically squeezes on the up-stroke of the piston and draws by gravity on the down-stroke. Each half of the machine is operated separately by means of one valve for jolting, squeezing and drawing the patterns. All castings are semi-steel. The wearing parts are steel, hardened and ground. The equipment can be employed for continuous pouring, as it can be arranged for any degree of flexibility required.

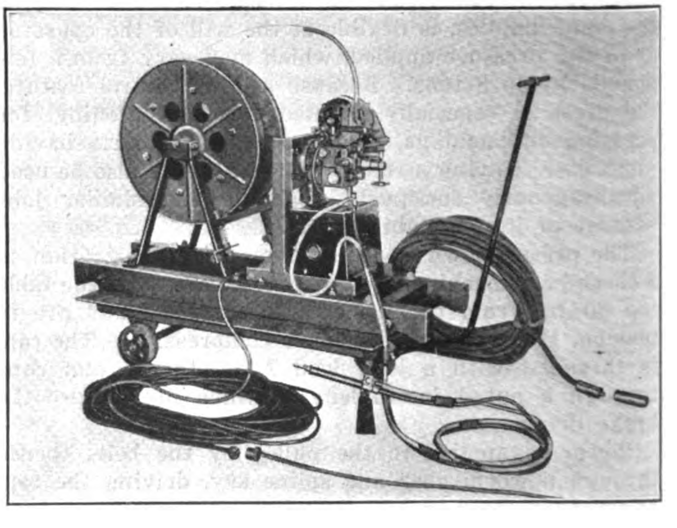
G.E. Portable Semi-Automatic Arc Welding Set

The General Electric Co., Schenectady, N. Y., has recently placed on the market a portable, semi-automatic electric arc welding set. The ability to move the machine easily increases the applicability of the apparatus, and makes it available for use in any part of the factory or shop. The set comprises complete semi-automatic equipment, all mounted on a small truck that can be pulled by hand or lifted by a crane. The complete outfit weighs about 400 pounds.

The welding equipment consists of a semi-automatic lead, an automatic welding head with control mechanism, and a standard for holding a reel of electrode wire. Power is supplied to the arc through a flexible cable with a plug for attaching it to the nearest welding circuit. The reel carrier is equipped with a brake and is intended to hold any size of reel up to 2½ ft. in diameter.

The portable outfit is particularly useful for repairing parts of machines in place when these parts are too bulky, inconvenient or otherwise impractical to move, as well as for doing routine welding of all sorts, such as filling holes in castings and welding seams in pipes or tanks.

It is stated that time can be saved in welding with the outfit because the electrode is fed continuously, and because the speed of deposition is from 25 to 100 per cent faster than that for hand welding. Material is saved by the elimination of waste ends, which usually amount to from 10 to 25 per cent of the total amount of electrode wire when it is used in short pieces. Since the welding operation is continuous, interruptions, which tend to affect the strength of the weld, are greatly reduced.



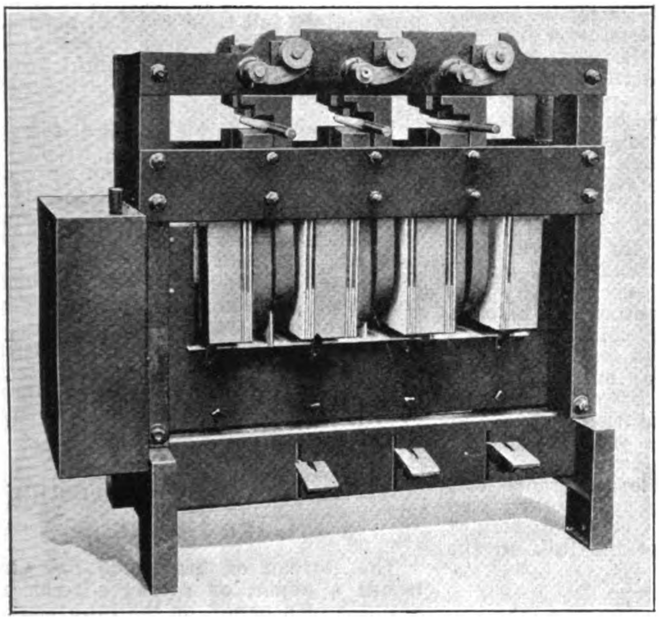
G. E. PORTABLE SEMI-AUTOMATIC ARC WELDING SET

Berwick Electric Heater for Forging

The American Car and Foundry Co., New York, N. Y., has recently brought out the Berwick two-path electric heater illustrated herewith. The machine is intended especially for forging operations requiring the heating of the ends of bar stock or points along the length of the material. This heating is accomplished without burning or melting the metal. Either 220 or 440-volt current can be used.

The heaters are ordinarily built with one, two or three electrodes, and may be supplied with four or five electrodes if necessary. The length of the heat on the stock can be varied from 1 to 8 in., or the machine can be arranged to heat lengths from 3 to 11 in. With slight changes in the heater, this length can be increased to 16 or 18 in. The range of diameter of the stock heated on the No. 3 heater varies from $\frac{3}{8}$ to $\frac{7}{8}$ in. to obtain a high production rate, although larger stock can be handled.

The heater is similar in method of operation to the Berwick rivet heater. The lower or left-hand electrode of each unit is stationary, while the upper or right-hand electrode has a vertical movement operated by depression of the treadle, which raises the electrode sufficiently to insert or remove the material.



BERWICK TWO-PATH ELECTRIC HEATER

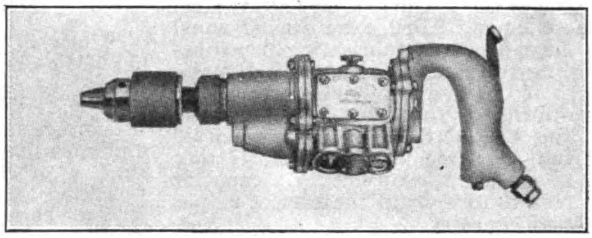
Each unit of the heater has two pairs of electrodes, insulated from each other. The right-hand electrode has at its two upper ends projecting blocks which overhang, but which are not allowed to touch the left-hand one. The left-hand electrode is stationary, so far as vertical motion is concerned, but may be adjusted horizontally by means of two bolts at the rear of the heater. Horizontal motion of the right-hand electrode is obtained by sliding the electrode-clamping device along the shaft on which it is mounted. Depression of the pedal causes rotation of the shaft, which through cams raises the shaft carrying the electrode.

Flexibility of the rear half of the bottom electrode is provided by a spring. The top face of the electrode is set at an angle so that when the upper electrode is dropped into position, contact is assured at four points on the material. Marring of the stock is decreased because of the increased number of points.

Thor "Pigmy" Portable Pneumatic Drill

The Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill., has recently placed on the market the Thor "Pigmy" portable pneumatic drill that is illustrated herewith. The drill has a pistol-grip handle, with the control valve within easy reach. It is non-reversible. The device is very light in weight.

The drill is made in three sizes, the No. 25 size having a drilling capacity of $\frac{1}{4}$ in. and weighing only 5 lb., the No. 375 size having a capacity of $\frac{3}{8}$ in. and weighing $5\frac{1}{2}$ lb., and the No. 50 size having a capacity of $\frac{1}{2}$ in. and weighing 6 lb. The speeds of the tools are 2,200, 1,400 and 1,000 r.p.m., respectively.



THOR "PIGMY" PORTABLE PNEUMATIC DRILL

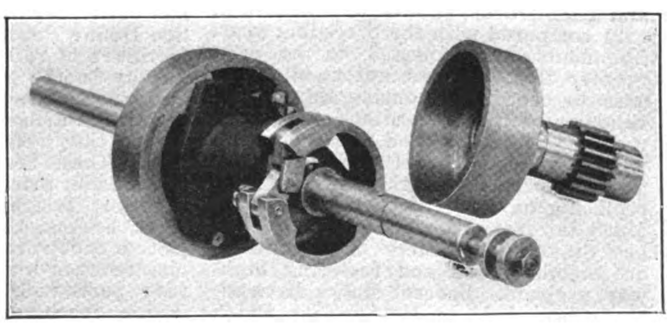
The drills are fitted with Jacobs chucks, the No. 25 having a No. 1B chuck, the No. 375 a 2B, and the No. 50 a 6B. A screwdriver attachment can be furnished; it is recommended especially for the No. 375 drill. A wire brush for cleaning purposes can be furnished for use on the No. 50 drill. The tool can, of course, be employed for reaming and wood boring, as well as drilling.

Friction Clutch for Greaves-Klusman Geared-Head Lathes

The accompanying illustration shows a friction clutch just placed on the market by the Greaves-Klusman Tool Co., of Cincinnati, Ohio, for use on its G-K geared-head lathes.

As compared with the former model, which expanded the ring on one side only and had one-sided fingers for spreading the ring, the present design expands the ring on both sides. The expanders are in the center of the clutch ring, operating to produce pressure directly on the toggle levers. Adjustment of the levers is by means of eccentric studs, so that the leverage applied always can be maintained the same. The driving hub is in one piece for both the forward and reverse clutches, giving a long bearing on the shaft and a long driving key.

The friction clutch has 50 per cent wider face, larger diameters on some sizes, and greater belt speed than in the former model.



GREAVES-KLUSMAN LATHE FRICTION CLUTCH

News Section

Structural Steel Sales Near Capacity

Orders for fabricated structural steel placed during April were almost equal to the capacity of fabricating firms, according to reports made to the Department of Commerce by firms comprising two-thirds of the fabricating capacity of the United States. Sales reported during April amounted to 115,247 tons by seventy-five firms having a capacity of 116,918 tons, or at the rate of 99 per cent of capacity.

At this rate, the total sales throughout the United States, based on a total capacity of 180,000 tons, were 177,600 tons in April. This compares with 139-300 tons reported for March by the Bridge Builders and Structural Society, based on reports of sixty-four firms showing sales at 77 per cent of capacity.

Experiments With Chilled Iron Car Wheels

Owing to the desirability of obtaining definite information concerning the magnitude and distribution of stresses in chilled iron car wheels and of determining the limit of these wheels as used today, with a further view of improving the chilled iron wheels in order to meet future requirements, an investigation was entered into by the Association of Manufacturers of Chilled Car Wheels and the University of Illinois. A bulletin presenting the results of the first part of this investigation has just been issued by the engineering experiment station of the University of Illinois. It is known as Bulletin 129 and gives the results of tests made to determine strain produced within the wheel by mounting it on its axle and by the application of wheel loads. The bulletin includes the general discussion of the general problem of wheel loading, the determination of the physical properties of chilled car wheel iron, a description of the apparatus and method used in the test, and a summary of the conclusions drawn therefrom.

Autos Growing Popular in Mexico

Imports of American motor vehicles into Mexico, consisting of 6,750 cars and 1,482 trucks, showed an increase in 1921 compared with the preceding year. Shipments are expected to be even greater this year, as automobiles are sure to contribute considerably in developing outlying sections. Already mining companies and oil operators, who have constructed roads between their properties and the railroads, are replacing ox teams with motor trucks. Much interest from official circles has been taken in matters of organizing automobile shows and fostering highway projects. Several shows have already been held in Mexico City and a national highway has been proposed to cover the entire country.

Weights and Measures Conference Urges Standardization

"Unity of action is impossible without organized conferences and established methods," said Secretary of Commerce Hoover in addressing the fifteenth annual conference on weights and measures, held recently at the Bureau of Standards in Washington. Speaking particularly to the state officials charged with the enforcement of laws pertaining to weights and measures, Secretary Hoover said: "Your work is not so much the prevention of crookedness and the apprehension of crooks, as it is the protection of the honest producer and distributor. I believe the vast majority of producers and distributors, as well as the whole of the consumers, are anxious that there be consistent scientific expansion in standardization."

There will be no legitimate objection to centralization, Representative Vestal, chairman of the Committee on Coinage, Weights and Measures, of the House of Representatives, told the conference, if the prosecution of offenders be left to the state and local authorities. "Let us have one central authority," he said, "to set up uniformity. Many manufacturers are writing to me asking for this very thing. This entire question is merely a matter of educating the people in standardization. Lack of standardization does not make for economy or for efficiency."

The program of the conference was so crowded that no opportunity was afforded C. A. Briggs, of the Bureau of Standards, to present his talk on the metric system.

Railway Mechanics Meeting and Exhibit

The third annual meeting of the mechanical division of the American Railway Association will be held in Atlantic City, N. J., June 14 to 21. This division comprises the former Master Car Builders and Master Mechanics Associations, and is the largest subdivision of the parent association. The exhibition this year will be the greatest ever attempted by the Railway Supply Manufacturers' Association, which acts in conjunction with the car builders. Over 100,000 sq.ft. of floor space has been prepared on the famous Million Dollar Pier, and the largest manufacturers of railway supplies will have display booths on the pier.

Headquarters of the convention will be the Marlborough-Blenheim Hotel, where the technical sessions will be held. These sessions will include discussions on prices, material, safety appliances, freight loading and equipment, brakes, car wheels, signals, locomotive construction, heating and boiler maintenance and sanitation. Committee reports will be received on welding, design, mechanical stokers, car dumping machines, tonnage rating and car repair shop layouts.

Final Declaration of Foreign Trade Council

At the close of the Ninth National Foreign Trade Convention, held last month in Philadelphia, the final declaration, which is a feature of the annual meeting of this body, was prepared and passed upon by the thirteen hundred delegates present from all parts of the country. The declaration, which is really a prescription or a suggested remedy for present business conditions, starts off with the statement that "the recovery of prosperity in the United States depends upon the ability of our people to sell at remunerative prices practically all they produce, running approximately full time and full handed."

The declaration, which covers every phase of business and manufacturing enterprise, includes the following subjects:

The need of foreign trade, foreign loans, foreign trade zones, credit to other nations, creation of loan corporations under the provisions of the Edge Act, reorganization to some extent of the Federal Reserve System, national taxation, merchant marine and marine insurance, simplification and standardization of procedure in trade practice, enactment of a trade act with China, a bargaining tariff, education in foreign trade, transportation, agriculture, and a final paragraph counseling courage and tenacity in the pursuance of foreign markets.

Scientific Paper on Testing Gage Blocks

The Bureau of Standards has just issued a paper, or rather a technical abstract of a paper, on the interference methods for standardizing and testing precision gage blocks. The experiment which led to the preparation of this paper was made by C. G. Peters and H. S. Boyd, of the bureau. The paper gives some interesting as well as new features of this very absorbing operation and the apparatus used for calibrating standards and comparing other gages with these standards is illustrated by line drawings and is thoroughly explained. The complete paper may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., for ten cents.

Bill to Supervise Weights and Measures

A bill regulating and controlling the manufacture, sale and use of weights and measures and of weighing and measuring devices has been introduced in the House by Representative Vestal, of Indiana, chairman of the Committee on Coinage, Weights and Measures. The bill confers jurisdiction over weighing and measuring devices on the Bureau of Standards, of the Department of Commerce, with authority to pass on their various types.

Business Outlook in Foreign Markets

The gradual return to a healthy business condition in foreign markets is evidenced by the cable dispatches to the Department of Commerce from the market places of the world. Conditions seem to be improving in all quarters, particularly in manufacturing centers. Unemployment is gradually disappearing and a final resumption of normal conditions is awaiting the bolstering up of the financial condition of the various nations involved.

The situation in Sweden in the iron and steel market shows a slight improvement. Production is slightly increased and prices are tending toward stabilization. Iron and steel production for the first quarter of 1922 is summarized as follows: Pig iron, 67,400 tons; Martin ingots, 41,500 tons; rolled iron and steel, 49,900 tons. Several foreign orders received during the spring have caused a resumption of work in three or four iron and steel mills.

In England there are distinct signs of improvement in the automotive field. A record trade was reported in some quarters before the dispute arose between the Engineering Employers' Federation and the Amalgamated Engineering Union, which began on March 11. Most of the manufacturers of motor cars and motorcycles are members of the federation. Since the lock-out they have been short of toolmakers and machinists.

In Japan the manufacturing industries in the iron and steel trade are gradually resuming. Iron and steel imported into Japan in 1921 amounted to 1,500,000 long tons, and this year present indications are that this amount will be greatly exceeded.

The prospects for the introduction of American tractors into the Netherlands at the present time are considered fair, though the market is limited. The matter of credit terms for the sale of tractors and farm implements is of little importance, as the farmers can well afford to pay for what they are willing to buy.

In Poland the automotive field is hampered by high prices. A high-class make of American automobile costs about 20,000,000 Polish marks, a sum which only four or five people in Poland could afford to pay. There is little demand for American trucks in Poland at the present time, especially since used trucks may be procured from army stocks at low prices. Also, the low quality and high price of gasoline and oil are not conducive to motor-car popularity. It is estimated that there are no more than 6,000 gasoline motor vehicles in Poland.

The American market continues to offer a profitable market for American goods. Tractors and all kinds of farm machinery find a ready sale in many of the southern republics. Mexico is also improving along these lines. All the implements and farm machinery used in the various agricultural regions in Mexico are imported from the United States and there is always a good demand among the farmers of the Yaqui Valley and also in the Mayo and Sonora Valleys.

Other markets show encouraging signs of resumption of business and it is expected that heavy buying will prevail when exchange rates are stabilized.

British Merchandise Act

An important bill amending the present merchandise mark act which prescribes the requirements for the marking of goods imported into the United Kingdom, has recently been submitted to the British Parliament, according to advices received by the Department of Commerce. The provisions of the act deal primarily with the marking of goods as to class and origin and are intended to protect British industries from unfair competition by foreigners. The act also prohibits the importation into the United Kingdom of goods to which there is applied a forged trade mark or description, or any goods bearing a trade mark of those manufactured in the United Kingdom. American exporters to the United Kingdom would do well to follow this bill and its course through the British legislature.

Duty on Auto Bodies

Automobile bodies recently imported have been held by the United States Court of Customs Appeals to be dutiable of 20 per cent as manufactures in chief value of metal. The merchandise had been assessed as automobile bodies, dutiable at 45 per cent. The Board of Appraisers, in considering the complaint of the importers, held the merchandise dutiable at 15 per cent as manufactures in chief value of wood. The court however held the merchandise dutiable at 20 per cent as manufactures in chief value of metal.

Diesel Engines on Swedish Railroads

A report from Consul W. H. Sholes, of Goteborg, Sweden, states that high operating costs on Swedish railways have caused a number of transportation companies in western Sweden to experiment with Diesel motor railway engines. Among these companies should be mentioned the Sarobanan (The Saro Railway Co.) and the Goteborg-Boras Jarnvag (Goteborg-Boras Railway Co.). In the light of the Halmstad Nassjo Railway Co.'s success with such engines it is not unlikely that they will be more generally adopted in this section of the country.

The first Diesel motor railway engine (75 hp.) was put in operation in Sweden in 1914 and has been in constant use ever since. Larger engines have since been found necessary, and now the 160-hp. type is preferred. Considerable savings in fuel consumption are said to have been effected, and the fact that only one attendant is required, as compared with two on a steam locomotive, is another argument advanced in its favor. Its advent seems to have set at rest the oft-expressed fear that such engines might not be quite safe on railways with great traffic.

American manufacturers of Diesel motor railway engines and similar substitutes for the steam locomotive should find this section of Sweden a prominent field for their products. A list of the State and privately owned railways in western Sweden may be consulted by interested parties on addressing the Transportation Division of the Department of Commerce, and referring to Exhibit No. 52451.

Austrian Industries Had Poor Year in 1921

The Department of Commerce has received an interesting report on Austrian industrial conditions from Consul C. H. Foster, of Vienna. The report states that the year 1921 was a somewhat difficult period for those Austrian industries making finished iron and steel goods. Prices increased considerably, particularly for files and rasps, wire ropes, ordinary wire, iron furniture, and machinery, so that exports became more and more difficult. Cables and wire ropes were almost barred from Czechoslovakia and Hungary.

At the beginning of the year orders were scarce in the wire, copper, and brass industries, as well as for tubings, tools, motors, presses and hydraulic plants, and agricultural machinery, but conditions became better toward the end of the year. Unfavorable conditions prevailed throughout the whole year for pumps, wire ropes, lifts, and elevators. Until spring conditions were good in those industries turning out pitchforks, cables, and Diesel motors, but toward the end of the year German competition grew threatening. A lack of raw material was felt in the industries for metal goods and plows.

Plenty of orders were received for piano wire, so that the one Austrian factory was well occupied. Plows, files, and rasps were in good demand. Cutlery was exported to the extent of 90 per cent of the production, the percentage being especially high for agricultural knives and saw blades. Locksmith's goods equaled only 80 per cent of their 1913 production but sold well. Screws and rivets, iron furniture, metal goods, machines, scales and weights, bicycles, and firearms were frequently ordered and these industries kept well occupied. The machine industry worked under favorable conditions; factories making specialties had many orders and exports were numerous.

Locomotive factories worked mostly for deliveries to other countries. In 1921, 300 locomotives were delivered, as against 211 and 144 in the two preceeding years, but difficulties in procuring raw materials were felt. To meet all demands some factories had to erect new buildings and make great investments. The Austrian railway-car factories produced one-third of their output for inland use and were, therefore obliged to work for export.

Pneumatic Tube Service in Postal Appropriation Bill

In consideration of the conference report on the postal appropriation bill for next year, the House adopted the Senate amendment for the transmission of mail by pneumatic tubes or other similar devices in New York and Brooklyn, at an annual expenditure not exceeding $18,500 per mile of double line of tubes, making a total appropriation therefor of $513,911. It is provided that either party to the contract may apply to the Interstate Commerce Commission for a revision of this rate before July 1, 1923, its decision to be effective after July 1, 1923, but in no case shall the rate exceed $19,500 per mile.

Kinsey Exhibition of Mechanical Equipment

Under the auspices of the E. A. Kinsey Co., and in the showrooms of that concern in the Kinsey Building, 331 West Fourth St., Cincinnati, Ohio, an exhibition of machinery and mechanical equipment will be held on June 7 to 10. The show will be a complete exhibition of machine tools, accessories, labor and time-saving devices of the latest models in design and construction. Over forty of the largest manufacturers of such equipment will be represented at the show, which is intended to benefit factory executies, purchasing agents, superintendents, foremen and master mechanics. Experts from the factories manufacturing the various equipment and tools will be on hand to demonstrate and explain.

There will be no selling during the exhibition, so that the entire time can be devoted to an undisturbed study of the machinery on exhibition.

Office Managers Meet at Washington

The third annual conference of the National Association of Office Managers was held in Washington, D. C., May 18 to 20. One hundred representatives of many of the largest concerns in the country were present to discuss principles of office management, and to exchange ideas looking to the more economical and efficient operation of large offices.

The meeting was addressed by speakers of note on such topics as: "Possibilities and Limitations of Psychology in the Office," by Dr. John B. Watson of New York; "United States Budget Bureau and Principles of Budget Making," by Gen. H. M. Lord, U. S. A.; "Personnel Work in the Office," by Dr. Charles R. Mann, of the War Department; and "Modern Office Planning," by Harry A. Hopf of New York.

The officers of the association are: President, F. L. Rowland, Gilbert & Barker Manufacturing Co.; first vice-president, G. R. Hulverson, Burroughs Adding Machine Co.; second vice-president, L. E. Stacy, Spirella Company; secretary, G. S. Childs, Alexander Hamilton Institute; treasurer, C. W. Kirkpatrick, Fisk Rubber Company.

Chemical Industries To Exhibit Machinery

The Eighth National Exposition of Chemical Industries will be held this year in the Grand Central Palace, New York City, during the week of September 11. It will follow immediately upon the fall meeting of the American Chemical Society.

The raw materials to be exhibited will be of the natural resources from out of the earth and above the earth. The machinery exhibits will consist of apparatus and equipment and instruments for control, precision, recording, gaging, measuring, and machinery for every mechanical operation in the manufacture of products from the raw materials. Many new things upon which manufacturers were working when the war ended, and which have since been more leisurely perfected, will be shown for the first time.

Engineering Council Recounts Its Achievements in 1921

The annual meeting of Engineering Council, of the Federated American Engineering Societies, was held in Pittsburgh May 26 and 27. It was the most successful meeting in the history of the council, and the reports of committees and officers showed great progress and recognition of the position of the engineer in public life. President Mortimer E. Cooley presided and in speaking of his tours throughout the country during the year, said that everywhere he found evidence that the federation idea was growing, and that substantial additions to membership might be expected in the near future. The most important discussion of the meeting was the registration of engineers, to control which laws have been passed, or are in process of legislation, in many states. The council expressed the opinion that such legislation may properly cover engineers and architects charged with the responsibility of public works, but not mining engineers. A resolution that the employment committee of the council go on with its investigation of the employment situation was adopted. The committee was requested to study and report any possibility of co-ordinating existing and local employment services into a national service. Another resolution adopted directs the council's committee on water power to place before the President the facts of the situation with regard to water power development in this country. A movement to conserve our national forests was set in motion by the appointment of a committee to study this phase of our national development. The board pledged its support to President Harding in his plan of government reorganization, and decided to keep up a nation-wide movement for the establishment of a Department of Public Works in the Cabinet. It was also brought out that committees are at work on a general policy of affiliation of American engineers with the engineering bodies of other nations. A movement is now on foot in Europe, led by Sir Robert Hadfield to form an Anglo-Saxon union of engineers, which shall include all the English speaking people of the world. Secretary Wallace's report recounted the achievements of the council during the past year. He gave some interesting figures, showing how the organization has helped the Government and business men in various ways.

Southern Metal Trades in Savannah

The fifth annual convention of the Southern Metal Trades Association is to be held in the Savannah Hotel, Savannah, Ga., June 19 and 20. This meeting will be devoted mostly to the hearing of reports from the officers of the association. Only two papers will be presented according to present arrangements. These are "Signs of the Times," by T. M. Cunningham, Jr., of Savannah; and "Sidelights on Cupola Practice," by Patrick Dwyer, editor, *The Foundry*, Cleveland, Ohio. G. F. Meehan, president of the association, will preside. The annual banquet will be held on the evening of the nineteenth in the banquet room of the hotel.

Invitation to Meeting of Construction Council

Lacking facilities at present for direct communication with the thousands of important men in the construction industry, the temporary directing committee of American Construction Council extends a personal invitation to each member of the industry to attend the organizing meeting in Washington, D. C., on June 19 and 20.

The step contemplated, that of bringing together for co-operation in behalf of the industry and of the public all the elements of construction activity—engineers, architects, labor, the contractors, the manufacturers and dealers, and the financial interests—is epochal in American industry. It deserves, and promises to have, the full support of the entire industry.

Full details of the plan are set forth in a comprehensive pamphlet, procurable from the temporary office, 1053 Munsey Building, Washington, D. C. The meeting will be held in the Washington Hotel. Secretary of Commerce Hoover will preside. R. C. Marshall, Jr. is chairman of the temporary directing committee.

Advertising Conference at Milwaukee

The program for the first National Industrial Advertising Conference, to be held in Milwaukee from June 11 to 13, has been just announced by the chairman of the conference, Keith J. Evans, advertising manager of Joseph T. Ryerson & Sons, Chicago. At the technical session, the speakers have been selected from a variety of industries and professions in the country. Some of the papers scheduled for presentation are: "Advertising as a Factor in Inter-Industrial Marketing," by W. W. Coleman, president of the Bucyrus Company, Milwaukee; "What the Department of Commerce is Doing to Aid Inter-Industrial Marketing," by F. M. Feiker, vice-president, McGraw-Hill Company, Inc., formerly assistant to the Secretary of Commerce; "Cutting the Cost of Distribution or Marketing in its Relation to Industrial Development," by Congressman Anderson, of Minnesota; "Advertising in Its Relation to the Four Points of Contact in Industry," by Bennett Chapple, director of publicity, American Rolling Mills. Speakers at some of the other sessions will be: Charles H. MacIntosh, of La-Salle Extension University; J. C. McQuiston, manager, Westinghouse Electric and Manufacturing Co.; H. Colin Campbell, manager of publicity, Portland Cement Association; Morris W. Leith, formerly Hill, Clark & Co.

Power Plant Exposition in New York

Announcement has been made of the National Exposition of Power and Mechanical Engineering to be held at the Grand Central Palace, New York, from Dec. 7 to 13.

The exposition will immediately follow the annual meeting of the American Society of Mechanical Engineers and it is expected that the exhibits will supplement the programs and discussions at the professional meetings of the society.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE

Editor, *Commerce and Finance*, New York

By an unusual coincidence last week included "Derby Day," "Memorial Day" and "Whitsuntide." The first is practically though not legally a holiday in England; the second, "Memorial Day," is widely observed as a legal holiday throughout the United States; and the third, "Whitsuntide," has become a vacation period in most of western Europe.

The result, in so far as business is concerned, was comparative quietude, of which we may take advantage to survey and interpret conditions. The revival has now reached the median stage and it is more difficult to read the future when things are on an even keel when they are at one extreme or the other.

At present every one is fairly cheerful. President Harding, and all his administration, is loudly proclaiming the advent of prosperity. Election day is approaching and there is, of course, a factor of political self interest in the cheerfulness, but there is also a substantial basis for it. As always, there are some things that are not as they should be but "normalcy" is not perfection and the ideal will not be attained this side the millenium. But good times are due to the dominance of the constructive spirit, and that spirit seems now to be spreading. It was thwarted at Genoa, but it has reasserted itself in the bankers conference at Paris as a result of which a loan of $1,000,000,000 will probably be made to Germany now that she has accepted the terms imposed.

Effect of the Loan

The stimulating and stabilizing effect that this loan will have in Europe is hardly appreciated in America as yet. It has already lifted sterling exchange to the highest figure touched since July, 1919, and even marks have advanced slightly in anticipation of German deflation.

That they can ever recover their prewar value seems impossible, but it is thinkable that a revival of speculative activity may carry them much higher, for at their present value of 38 cents a 100 the entire 142 billion marks now outstanding are worth only $539,000,000; this is hardly more than half the loan that is under consideration. If marks go up it is probable that the other depreciated currencies of the Old World would advance concurrently.

The result would be a sudden and substantial increase in the purchasing power of Eur[illegible] It is plain that this would mean much to America as well as to England and its tonic effect is to be reckoned with as a possible and a very important influence. Certainly the program of reconstruction in Western Europe seems sufficiently advanced to justify reliance upon its ultimate completion and there is reason to hope that as it progresses sane government may be established in Russia.

So much for conditions overseas. Turning from them to our domestic affairs there is equal reason for confidence. Unemployment continues to decrease, bank clearings are steadily improving, retail trade is gaining.

With the exception of wheat, which has declined sharply because the "May deal" has collapsed, the great agricultural staples are selling at prices that are fairly satisfactory. The steel mills are getting busier; some of them are working up to capacity. The automobile business is booming.

Railroad earnings for April were surprisingly good when the curtailment of coal traffic is considered. Good judges expect a further improvement after July 1 when the lower freight rates become effective.

The reduction in employees' wages ordered by the Labor Board has led some of the Brotherhoods to order a vote upon the question of striking, but no one expects that it will be anything more than a gesture. The textile strike in New England is gradually settling itself as the hands return to work and the mills reopen one by one. By "moral suasion" Secretary Hoover is trying to fix the price of bituminous coal at $3.50 f.o.b. West Virginia mines during the continuance of the strike. He may not succeed but if he fails Congress will probably give him the legal authority that he lacks in order to deal effectively with a very perplexing and difficult problem. Credit is abundant. Money is easy and the weekly statement of the Federal Reserve System shows a gain of one-half of 1 per cent in the reserve ratio, which now stands at 78 per cent. This is apparently due to a decrease of 40 millions in deposits for there has been no change in the amount of gold held.

Winter Wheat Promising

It is too early to say much about the condition of the crops, though the indicated yield of winter wheat is slightly in excess of last year, but barring the unforeseen and assuming a satisfactory harvest it seems reasonable to count upon good and improving business for at least six months. This will carry us up to and over the elections and while it is not to be inferred that their effect will be disturbing it is admittedly uncertain and business abhors uncertainty. With this conservatively optimistic view the security and financial markets seem to be in agreement. A renewed demand for bonds was met with a number of new issues, including a loan of $24,000,000 to the Republic of Bolivia, which was offered and well taken on a basis which yields 7.92 per cent.

The stock market has been relatively quiet. The Supreme Court has severed the Central Pacific from the Southern Pacific Railway, but the union forbidden would probably be legal under the Esch-Cummins Bill and it is doubtful whether the severance decreed will ever become a fact. The reorganization of the International & Great Northern has been completed. It probably presages the acquisition of that railroad by the Frisco.

The merger of the Republic Iron and Steel Co. with the Midvale and the Inland Steel Co. is also announced, but many legal hurdles will have to be cleared before it can be consummated. The Tobacco Products Co., the United Retail Stores Corporation and the United Cigar Stores Co. have also been put together, but the market effect of these combinations has been negligible, for speculators have ceased to believe that the whole can be made greater than the sum of all its parts.

This is one reason why the recent advance in securities represents an appreciation of real rather than fictitious values. It rests upon the substantial basis of intelligent investigation, for at no time since it commenced last January has there been much reckless speculation. Therefore there is reason to expect a further advance as the prosperity of the country is reflected by increased earnings, and it is among the railway stocks that the most striking examples of the relation between larger corporate profits and higher market values will probably be found.

Commodity Markets Firm

The commodity markets call for but little comment. Sugar has been conspicuously firm and substantially higher prices seem indicated by the rapidity with which the supply has been absorbed. Rubber is also in better demand at a slight advance. Cotton halts around 20 cents with the trade in doubt as to the accuracy of the many crop reports, public and private, that have been issued. The statistics indicate ultimate scarcity, but a present sufficiency and with every one bullish experience suggests caution rather than blind confidence in a further advance.

The sensational losses sustained by those who were long of May wheat have had a sobering effect upon the Chicago Board of Trade, but the market there now has a healthier tone and present prices are probably below intrinsic values. Petroleum and most of its products are higher. The supply is increasing but so is the demand.

The dry goods trade in both woolen and cotton goods is more active and prices are higher. Small stocks and a shortage in many lines are reported. An unusual demand for women's footwear is noted, though men do not seem to need as many shoes as formerly. Tariff uncertainties are creating some areas of dull trade in imported goods and the bonus bogy has been revived.

But the vagaries of Congress and the coal strike are about the only clouds in the June skies. They are not sufficiently dark to obscure the sunshine. The public has become accustomed to them. They are no longer feared, and those who are unafraid are not easily depressed.

Machinery Exports Drop Lower in April

Exports of metal-working machinery dropped back again in April. The value of all exports of such machinery in April of this year was $786,951. This is a quarter of a million dollars less than in March and but little more than one-third of the value of such exports in April of 1921. The detailed figures, taken from the work sheets just compiled by the Bureau of Foreign and Domestic Commerce, are as follows:

EXPORTS OF METAL-WORKING MACHINERY

	April, 1921	April, 1922
Lathes	$335,614	$45,608
Boring and drilling machines	....	25,280
Planers, sharpeners and slotters	....	25,685
Bending and power presses	....	644
Gear cutters	....	3,307
Milling machines	....	17,591
Sawing machines	....	1,329
Thread cutting and screw machines	....	15,229
Punching and shearing machines	....	8,700
Power hammers	....	5,723
Rolling machines	....	221
Wire-drawing machines	....	808
Polishing and burnishing machines	....	2,879
Sharpening and grinding machines	84,946	67,804
Chucks, centering, lathe, drill and other	....	10,105
Reamers, cutters, drills and other parts for machine tools	....	122,851
Pneumatic portable tools	....	17,919
Foundry and molding machinery	....	35,834
Other metal-working machinery and parts of	....	379,434
Total metal-working machinery	$2,055,422	$786,951

IMPORTS

	April, 1921	April, 1922
Machine tools	$29,412	$10,818

AUTOMOTIVE EXPORT FIGURES

	April 1921	April 1922	Up to May 1 1921	Up to May 1 1922
Passenger cars	$2,931,233	$4,822,737	$15,338,322	$13,236,698
Trucks	....	647,747	5,346,896	2,054,970
Parts	3,195,698	3,933,438	19,399,931	12,428,855
Total	$6,126,931	$9,403,922	$40,085,149	$27,720,523

Metal Trades Grow in San Francisco District

"Payrolls are what make for improvement in banks, stores, buildings, homes, education and culture, and the manufacturing metal trades provide the steadiest and biggest yearly payrolls of any industry."

This statement of the importance of the metal trades industry in San Francisco's economic life was made by Fred Metcalf, commissioner of the California Metal Trades, in a discussion of this subject prepared for the San Francisco Chamber of Commerce. The recently completed industrial survey of 1920 business made by this chamber was the first definite and planned attempt at such local inventory, and while it was probably incomplete because of the newness of the idea, it showed very concisely the principal sources of the city's income.

With only 380 metal trades firms reporting, the survey showed the metal group near the head of the list in point of payroll, number of men employed and value of plant equipment. The totals make impressive reading for business men. The $28,349,763 paid to the 21,816 workmen in wages was either spent in the stores, or for homes, or deposited in savings banks. A good part of the $137,281,180, representing the value of the products, was in local supply houses and by them put into circulation on their payrolls.

Plant and equipment represent an investment of over fifty million dollars, which is being devoted to build up an industry to compete with other sections of the country.

A large part of the machine shop equipment in San Francisco is up to date, says the report, but more machinery is needed in other trades and particularly automatic machinery for quantity production.

Briefly summarized, the metal trades industry of the San Francisco Bay District is today equipped to handle practically everything that is required in its line. The report further states that there are five shipyards, equipped with accommodations for the smallest up to the largest vessel. There are six marine ways that will handle up to a 5,000-ton ship. All of the six larger yards are equipped to do machine and boiler work, and the three largest have fully equipped machine and boiler shops to handle jobs of any nature and size.

There are forty-five foundries, both iron and brass. Five steel mills are in operation. Mining machinery, pumps, pulleys and conveyors, refrigerating equipment, overhead cranes, hoisting machinery, boilers, tanks, compressors, canning machinery, hydraulic and electric presses, tools, gears, saws, bolts, nuts, elevators, heating plants, oil-burners, dredging equipment, cars and running gear, filters, water wheels and such lines are specialized in by approximately thirty-five firms in San Francisco.

Selling the World

Through the efforts of a committee of trade association executives, appointed by Gordon Lee, chief of the automotive division of the Bureau of Foreign and Domestic Commerce, of the Department of Commerce, a booklet has just been issued by that department, entitled "Selling the World." It is really a piece of sales promotion literature and this is probably the first time that a Government department ever used this means of offering its services to the industry which it represents. The report outlines the opportunities available for American automotive manufacturers in international trade, and shows how practical commercial assistance is being given by the automotive division of the Bureau of Foreign and Domestic Commerce, under direction of Mr. Lee.

Associations which aided in the preparation of this book were: The National Automobile Chamber of Commerce; Motor and Accessories Manufacturers Association; Automotive Equipment Association; Motorcycle and Allied Trade Association; National Association of Engine and Boat Manufacturers; Association of Automotive Equipment Manufacturers; The Black & Decker Manufacturing Company.

British Manufacturer Here on Business Trip

Arthur Hungerford Pollen, chairman of the board of Burton, Griffiths & Co., Ltd., and of the B. S. A. Tools, Ltd., of England, has arrived in the United States to visit the manufacturers which his company represents in Great Brittain.

Mr. Pollen is a writer of international reputation on naval subjects, is a graduate of Oxford University, a keen student of economic developments and for many years has been a director of important British manufacturing corporations. He is also chairman of the executive committee of the British Commonwealth Union, an association of leading manufacturers and industrial corporations in Great Britain organized for the study of legislative questions affecting industry, and for presentation of economic facts to the public. Mr. Pollen is a director of the Linotype and Machinery, Ltd., and also a director of the Mergenthaler Linotype Co. of New Jersey. The companies affiliated with Burton Griffiths & Co., Ltd., and the B. S. A. Tools, Ltd., are: Wm. Jessop & Sons, Ltd., Brightside Works, Sheffield, England; B. S. A. Tools, Ltd., Sparkbrook, Birmingham, England; B. S. A. Guns, Ltd., Small Heath, Birmingham, England; B. S. A. Cycles, Ltd., Small Heath, Birmingham, England; B. S. A. Company, Ltd., Small Heath, Birmingham, England; the Daimler Co., Ltd., Coventry, England.

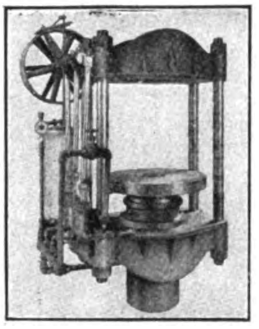
Engineer Delivers Books to Russian Library

Theodore Weinshank, engineer, of Indianapolis, and member of the American Society of Mechanical Engineers, has just returned from Russia, whence he went as the emissary of the society, to deliver the nucleus of a technical library of 810 volumes of books on scientific and engineering subjects. Mr. Weinshank delivered a package of thirty volumes of up-to-date engineering books at the Bolshevik headquarters at Kremlin. There he talked to the head of the mechanical rehabilitation division of the Bolshevik government, G. Krjijanovski. The library, which will consist of the full 810 volumes when complete, will be in English, French and German, and will be opened at Kremlin, in charge of a Soviet official. The society believes that it will be a good investment for American manufacturers, because it will make it possible for Russian engineers to so develop their industry that the need for American machinery and manufactured products will be necessary to the complete reorganization of their industries.

Condensed-Clipping Index of Equipment

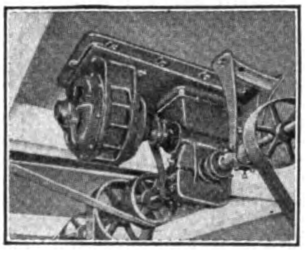
Patented Aug. 20, 1918

Press, Tire, Hydraulic
West Tire Setter Co., Rochester, N. Y.
"American Machinist," February 23, 1922



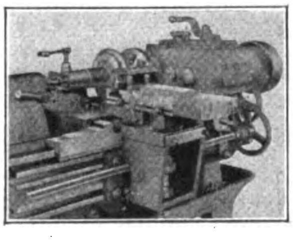
The press is used in pressing solid rubber tires on and off automobile truck wheels. A ram 16 in. in diameter gives a maximum pressure of 250 tons at the platens. The press is driven by belt on a 30-in. pulley running at 175 r.p.m. The pump, located at the side of the lower resistance member, has three plungers, one large and two small. Platens, 42 in. in diameter; maximum vertical distance between platens, 37 in. Ram stroke, 33 in. Vertical strain rods: diameter, 4½ in.; distance apart, 43 in. Height, 9 ft. 3 in.

Drive, Line Shaft, Worm
Cleveland Worm and Gear Co., Cleveland, Ohio
"American Machinist," February 23, 1922



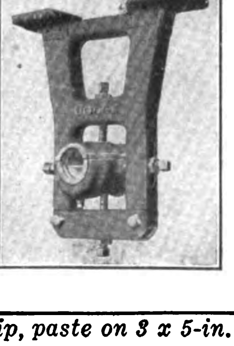
The connection between motor and shaft through the worm and worm wheel eliminates speed fluctuation due to belt slip. With the large speed reduction ratio, a motor operating at 1,800 r.p.m. can be used, even for shafts running at low speed. The reduction unit is mounted on a bed plate with the motor, and the whole attached to the ceiling, or placed upright on a platform. The drive mechanism is compact and completely inclosed.

Attachment, Lathe, Back-Facing, Semi-Automatic
Seneca Falls Manufacturing Co., Inc., Seneca Falls, N. Y.
"American Machinist," February 23, 1922



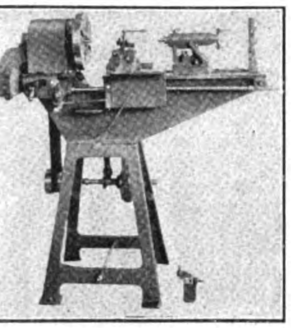
The device is adapted to bevel gear work, bevel cuts being made at the same time the shank is turned. It has nine in-feeds from 0.003 to 0.050 in. per spindle revolution, and 27 reverse feeds from 3 to 15 times the forward feed, to secure the proper timing for back-facing, necking, under-cutting and grooving. The in-feed stop will reverse automatically, and the out-feed automatically stops at the end of the cycle.

Hanger, Line-Shaft, Pressed-Steel
Dodge Sales and Engineering Co., Mishawaka, Ind.
"American Machinist," February 23, 1922



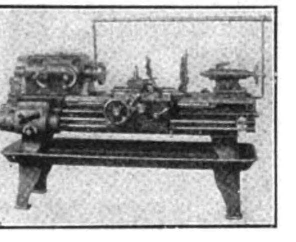
The hanger is intended for general use where extreme vibration is not encountered, and is not adaptable to heavy-duty. It is light and strong, being made of sheet steel pressed to shape and riveted and bolted together. The bearing floats in the hanger so as to align itself to the shaft. By setscrews with locknuts, the bearing can be brought to the proper height and lateral position.

Lathe, Gap, 11 x 24 In.
Artisan Manufacturing Co., Cincinnati, Ohio
"American Machinist," February 23, 1922



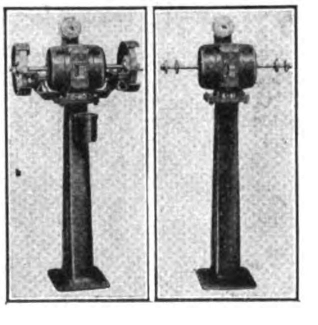
The lathe has a quick-change feed box containing the gears and a clutch for engaging and disengaging the feed, operated by a lever. The double-crank handle at the right of the feed box is for manipulating the feed by hand. Standard threads from 8 to 224 per in. can be cut, including a 11½-in. pipe thread. The cross-slide can be swiveled for turning angles. A ½-hp. motor may be attached to the machine. Sliding back gears with a three-step cone pulley give six speeds, in geometrical progression. Swing: over carriage, 6½-in.; in gap, 16-in.

Lathe, Toolroom, 14-In., Sundstrand
Rockford Tool Co., Rockford, Ill.
"American Machinist," February 23, 1922



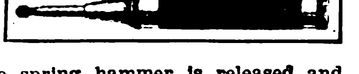
The lathe can be furnished with either cone or geared headstocks. The 4-step cone headstock is single back-geared with ratio of 8¼ to 1, and takes a 2½ in. belt. The carriage is controlled by a handle on the stop rod at the right of the apron. When cutting threads, the carriage can be automatically stopped by collars on the stop rod. A threading dial is furnished for thread cutting. Forty-eight thread and feed changes ranging from 1½ to 92 are provided. Swing: over bed, 15 in.; over carriage, 8¾ in. Feeds, 6 to 268 r.p.m. per inch. Floor space, 27 x 82 in. Weight, 2,500 lb.

Grinder and Buffer, Electric
Columbia Manufacturing Co., Belleville, Ill.
"American Machinist," February 23, 1922



The machine is used for sharpening tools and for general light machine shop or garage grinding. It is driven by a ¼ hp. electric motor, operating at 1,800 r.p.m. on single-phase, alternating current of 60 cycles and either 110 or 220 volts. The grinder is supplied also for bench use, and is equipped with adjustable tool rests, wheel guards and water pot. Wheels 8 in. in diameter and 1 or 1¼ in. thick are used. A switch is mounted on the motor. Spindle: ¾ in. diameter; length, 23 in.; height from floor, 36½ in. Weight, 145 lb.

Hardness Testing Punch, Portable, "Auto Punch"
Case Hardening Service Co., 2283 Scranton Road, Cleveland, Ohio
"American Machinist," January 19, 1922



The device is made in two sizes, the 12-in. size for work on steel, iron and hard metals, and the 6-in. size for sheet brass and thin metals. By pressure on the barrel the spring hammer is released and strikes the ball. The resulting depression in the work is then measured, as in the Brinell test. The tested piece must rest on a solid support, but usually can be tested in position. The hardness of steel plate, stampings, forgings and castings, as well as that of case-hardened and heat-treated work, can be determined. A pressure of 850 kg. on a ½-in. ball gives a depression of the same size as that of the 12-in. punch when testing mild steel.

[This clipping supersedes the one appearing on page 688g.]

Clip, paste on 3 x 5-in. cards and file as desired

Tractor Company to Build Motor Car

The Cleveland Tractor Co., well known as makers of Cletrac tractors will shortly be reorganized as the Allyne-Zeder Motors Co., and will take up the manufacture and distribution of a new six-cylinder automobile, which is being designed by F. M. Zeder, formerly chief engineer of the Willys Corporation and also at one time connected with the Studebaker interests. The new corporation will have a capital stock of approximately $10,000,000.

A subsidiary company, to be known under the old name of the Cleveland Tractor Co., will continue the marketing of Cletracs through the present distributors and dealers. A new one-ton truck, designed by R. H. White, will be added to the Cletrac line in the near future. Two of the Studebaker family will return to the automobile industry in the organization of the Allyne-Zeder Co. Clement Studebaker, Jr., and his brother, George M. Studebaker, former directors of the Studebaker Corporation, will be stockholders in the new automobile company. Rollin H. White, president of the Cleveland Tractor Co. and a director of the Aluminum Manufacturers' Inc., will be president of the new corporation. Other officers will be: R. T. Hodgkins, vice-president and general sales manager; A. F. Knobloch, vice-president and works manager; F. M. Zeder, vice-president and chief engineer; T. D. Fleming, treasurer: E. D. Wilson, motor car sales manager; O. R. Skelton, assistant chief engineer; Carl Breer, assistant engineer; and J. O. Hahn, associate engineer.

Promoters of the reorganization expect that a production of 12,000 automobiles and 12,000 tractors will be reached in 1923.

Business Items

The name of the Napier-Bliss Co., Meriden, Conn., has been changed to the Napier Co. Officers of the company will remain as follows: J. H. Napier, president; W. E. Bliss, vice-president; H. M. Smith, secretary; F. W. Rettenmeyer, assistant secretary; and E. A. Schwartz, sales manager.

The Asa S. Cook Co., of Hartford, Conn., has opened an office in Room 505, Superior Bldg., Cleveland, Ohio. Ernest W. Duston is in charge.

The New Process Gear Co., a subsidiary of the Willys Corporation has been awarded a contract for gears for the Durant car. The plant is now running night shifts to keep up the production schedule.

The Eastern Brass and Ingot Corporation, a New York corporation maintaining a brass reclaiming plant in Waterbury, Conn., has gone into the hands of a receiver. G. E. Dalbey, former metallurgist of the company, has been appointed receiver by Judge Edwin S. Thomas of the United States District Court. It was announced that the plant will be closed down for several months.

The Pioneer Metal Goods Corporation, 317 West 125th St., New York, has filed notice of dissolution.

The General Steel and Machinery Co., Detroit, Mich., has arranged for a change of name to the General Steel Corporation, to operate with a capital of $50,000.

The Cleveland Duplex Machinery Co., Inc., of 1224 West Sixth St., Cleveland, Ohio, has been appointed the exclusive representative of the Diamant Tool and Manufacturing Co., Inc., of Newark, N. J. The territory included in the agreement takes in all of Northeastern Ohio.

The Spare Turn Tractor Co., Norfolk, Va., manufacturer of motor tractors, has filed notice of increase in capital from $1,000,000 to $2,000,000, for proposed expansion.

The Illinois Wire and Cable Co., Sycamore, Ill., has arranged for an increase in capital to $450,000.

The Bloomsburg Locomotive Works, Bloomsburg, Pa., recently organized, is said to be arranging for operations at the plant of the Bell Locomotive Works. Improvements will be made in different departments.

The Worm Piston Ring Co., 1002 First National Bank Building, Detroit, Mich., has been organized under state laws with a capital of $50,000, to operate a plant for the manufacture of piston rings, automobile parts, etc. The company is headed by Emil Kottusch, Edgar J. Geist and J. Charles Wood, 4746 Second Ave., Detroit.

The Northwest Foundries, Inc., Rochester, N. Y., has filed notice of increase in capital to $250,000 for proposed expansion.

Officials of the Underwood Typewriter Co., Hartford, Conn., have voted to continue the profit-sharing system at the plant, making the fifth year of operation under the bonus plan. Employees who will share during the present year will include those who have been connected with the company continuously for three years prior to Jan. 1, 1922. As an extension to the plan, arrangements have been made to permit employees who have been with the company for one full year, prior to Jan. 1, to subscribe to either the common stock of the corporation or participation certificates.

Plans for developing the tap, die and screw plate business of the Gardner-Bryan Co., Cleveland, Ohio, are included in the incorporation of the Gardner Tap and Die Co., that city. The new organization will be headed by F. W. Wood, president of the Wood & Spencer Co. and the Cleveland Castings Pattern Co. Associated with him will be J. M. Gardner, vice-president and sales manager of the Gardner-Bryan Co., who will be vice-president of the new company; R. H. Smart, also of the old concern, as treasurer; and D. B. Miller, of the Wood & Spencer Co., as secretary.

The Star Welding Works, at New Orleans, La., has been purchased by Claibourne Andrews and Edward Pickett. A general reorganization of plant and methods will be made.

The Tuthill Supply Co., of Hartford, Conn., has been incorporated under the laws of Connecticut to deal in mill supplies, machinery, etc. The capital stock of the concern is $50,000 and the incorporators are: William D. Tuthill, of 41 Brownell Ave., Hartford; J. C. Kirk, of Hartford; and H. W. Stacy, of Springfield, Mass.

The Rensselaer Machine Co., Inc., has been organized at Rensselaer, N. Y. to manufacture tools, machinery and factory equipment. Incorporators are Henry Billings, 19 Cleveland St., Albany, N. Y.; W. E. Gordon and H. M. Van Alstyne.

The foundry and pattern shop of the Turner-Frick Gas Engine Works, at Sharon, Pa., has been purchased by a group of foundrymen and reorganized as the Star Foundry and Machine Co. Directors include Fred Lutz, J. A. Turner, Joseph Stahl and Lawrence Conway, of Sharon.

Announcement has been made of the merger of the Christopher & Simpson Gear Works, of St. Louis, Mo., with the Decatur Bridge Co., of Decatur, Ill. The new organization will be known as the Mississippi Valley Structural Steel Co., and will have a capital of a million and a half dollars.

The Blake-Fitchburg Pump Co., of Fitchburg, Mass., will move its entire equipment to a new plant in Akron, Ohio.

Worthington Pump and Machinery Corporation has purchased the drawings and patterns covering centrifugal pumps and pumping machinery manufactured by the Camden Iron Works, Camden, N. J.

United Alloy Steel Corporation has taken over the Canton Sheet Steel Co., owned by the Hydraulic Steel Co., of Cleveland, it was announced by E. A. Langenback president of United Alloy. By taking over the new company, 12,000 to 15,000 tons will be added to United's production.

Personals

CHARLES S. CRAWFORD has been appointed chief engineer of the Stutz Motor Car Co. of America, Inc., Indianapolis, Ind. He has at different times been connected with the Lozier, Cole and Premier companies.

B. L. MORGAN has been appointed superintendent of the Erie Specialty Co., Erie, Pa.

JOHN F. SCHURCH has been elected a vice-president of Manning, Maxwell & Moore, Inc., of New York. He will be in charge of the Western sales division, with headquarters in the company's Chicago office at 27 North Jefferson St.

NORMAN R. SEIDLE has resigned as assistant general manager of the Jas. G. Heggie Co., of Joliet, Ill., to become works manager of the General Boilers Co., Waukegan, Ill.

FREDERICK R. PRATT, machinery construction superintendent in Japan for the Whitin Machine Works, manufacturer of cotton mill machinery, of Whitinsville, Mass., left the United States on June 6 for the Orient. Mr. Pratt has been in the United States a short while visiting the plant in Whitinsville.

B. H. BRISTOW DRAPER, vice-president of the Draper Corporation, manufacturer of cotton mill machinery, Hopedale, Mass., sailed from New York recently on a business trip to Europe.

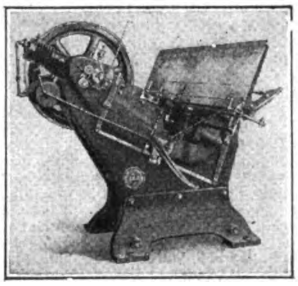
HAROLD P. DAHLQUIST has been promoted to the position of office manager of the Chicago branch office of the Walworth Mfg. Co., wrench manufacturers, Boston, Mass.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

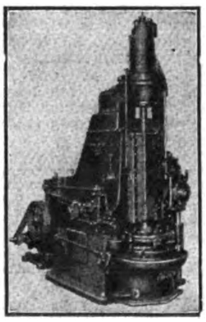
Press, Punch, Stagger-Feed, Automatic, Inclined, No. 564-A.
Adriance Machine Works, Inc., Brooklyn, N. Y.
"American Machinist," March 2, 1922

The machine is intended for the production of cans, small shells and jar closures. Lithographic designs can be accurately fed and registered. The scrap is ejected automatically and cut into skeleton frames. Due to the staggered feed arrangement, blanks are punched out with but a thread of metal between them. Only one die is used. The speed is obtained by the continuous action of the punch. The sheet carrier can travel in either direction, holes being punched on both the forward and back movements.



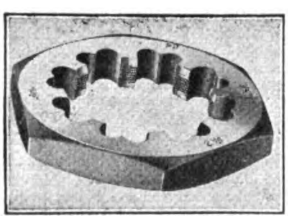
Shaper, Gear, tiple, Vertical-Spindle, Down-Stroke, 6-A
Stevenson Gear Co., Indianapolis, Ind.
"American Machinist," March 2, 1922

The machine operates as a vertical shaper or slotter, except that the tools are stationary and the gear blanks are reciprocated past them. A feed mechanism brings the tools gradually to depth on successive cuts, and an indexing mechanism rotates the gear blank an amount equal to one tooth at every stroke of the ram. The toolhead, a flat steel plate 30-in. in diameter, has a hole in the center and a number of radial grooves in its face. Each machine has two toolheads, one being used while tools on the other are sharpened and reset. Driving power is furnished by a motor in the rear while power for elevating the ram is obtained from a small motor mounted at the back at the right.



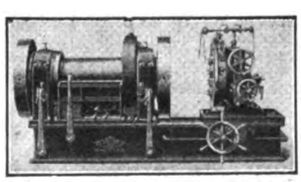
Die, Re-Threading, Hexagon, for Ford Hubs
Greenfield Tap and Die Corporation, Greenfield, Mass.
"American Machinist," March 2, 1922

The die is $2\frac{1}{2}$ in. in diameter, and has 24 threads per inch. There are eight flutes. The tool is for the use of repair men to refinish the threads on the hub. The threads may thus be put in proper condition after they have been injured.



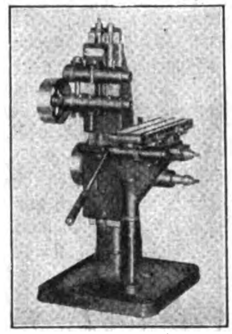
Threading and Cutting Machine, Pipe, 12-In.
Landis Machine Co., Waynesboro, Pa.
"American Machinist," March 2, 1922

The machine uses two dieheads and may be equipped for threading line pipe, oil well casing and hydraulic pipe, or to thread and cut pipe as small as $2\frac{1}{2}$ in. It has a normal range from 4 to 12 in. pipe. The power traverse movement operates either forward or backward, controlled by a lever. Automatic stops prevent the diehead from coming in contact with the chuck, and the carriage from running off the guides. The reamer is fed to the pipe by rotating the cutting-off feed handwheel. Eight variations of speed can be obtained in the speed box.



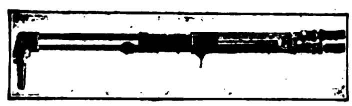
Milling Machine, Hand, Duplex
Superior Machine and Engineering Co., Detroit, Mich.
"American Machinist," March 2, 1922

The machine is used for slitting step-type piston rings, for sawing apart babbitt-lined automobile crank-shaft bearings and for milling two keyways or slots at the same time. It is driven from the main-line shaft, or can be furnished with a $1\frac{1}{2}$ hp. motor. Graduated dials are provided on all adjusting screws for indicating accurate adjustments. The table is operated by a hand lever, through a rack and pinion. Weight, 900 pounds.



Torch, Cutting, Oxy-Acetylene
Davis-Bournonville Co., Jersey City, N. J.
"American Machinist," March 2, 1922

The torch is lighter than the former model, and has two tubes instead of three connecting the head with the handle. Oxygen and acetylene are mixed in a chamber between the handle and the head in a ratio controlled by two needle valves. A special tip is used. The back end of the torch can be removed for cleaning. The number of preheating holes varies from two to six, depending on the combustible gas, the application and the metal to be cut. Bent tips for cutting off rivets are furnished. Butane, hydrogen or even illuminating gas, may be used.

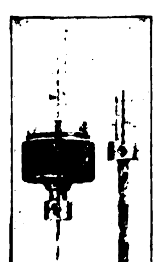


Spindles, Grinding Machine, Belt or Air-Driven, Parker
Ex-Cell-O Tool and Manufacturing Co., 1214 Beaubien St., Detroit, Mich.
"American Machinist," March 2, 1922

The spindles, used for very high speeds, can be furnished to fit any make of grinding machine. A special mounting holds the spindle. The turbine is at the right, inside the cylindrical case. The steel rotor is equipped with thirty buckets on its periphery to which air is carried through two nozzles. Air pressure varies from 40 to 60 lb. per sq. in., depending on speed, which may be as high as 100,000 r.p.m. The belt-driven spindle has two ball bearings for both the spindle and the pulley shaft. No belt pull is placed on the spindle.

Chuck, Drill and Tap, No. 12
SaveAll Tool Co., 49 River St., Waltham, Mass.
"American Machinist," March 2, 1922

The chuck has a friction drive, a positive safety device and a No. 2 Morse taper shank. Its capacity is from $\frac{1}{8}$ to $\frac{3}{8}$ in. Collets can be furnished with the size of hole required to hold the drill. The drill is fastened in the collet by a hollow-head setscrew. The device is equipped with a shearing pin and allows drilling at high speed.



Clip, paste on 3 x 5-in. cards and file as desired

T. M. HAMER has recently joined the general sales department of the Gilbert & Barker Manufacturing Co., Springfield, Mass., and will handle the company's interests in Montreal, Canada.

C. C. WELLS, formerly of the Butterfield division, Union Twist Drill Co., Derby Line, Vt., has assumed charge of production for the Vermont Tap and Die Corporation, Newport, Vt.

HENRY WANNAMAKER, formerly of the New York Central Railroad, is now superintendent of motive power for the Boston & Albany Railroad.

FRANK GIBBONS, who has been in the general offices of the Central Steel Co., Massillon, Ohio, for a number of years, has been appointed sales manager for the Cleveland district.

C. C. UPHAM has been elected a director of the Superior Sheet Steel Co., Canton, Ohio. He succeeds E. W. Stevens, who resigned.

WILLIAM J. MERTEN, metallurgical engineer of the Westinghouse Electric and Manufacturing Co., has been elected vice-chairman of the Pittsburgh chapter of the American Society for Steel Treating.

HARRY T. BUSICK, formerly export manager for Young, Corley & Donald, Inc., 115 Broadway, New York, is going abroad to introduce American metal-working machinery in continental Europe. His headquarters will be in Paris. Mr. Busick is undertaking this venture solely on his own account, having no connection with any export firm.

A. H. G. FOKKER, famous Dutch airplane manufacturer, has arrived in the United States to introduce two of his latest model air machines.

Book Reviews

Manual for Engineers. By Charles E. Ferris, B. S., Dean of the College of Engineering, University of Tennessee. Published by the University Press, Knoxville, Tenn. Price 75 cents.

This book, which is pocket size, is in its twenty-fourth edition and contains about fifty tables and other data for engineers and business men. In addition to the tables there are paragraphs here and there which explain the value of education to the individual and to the state, and the value of manual training to negroes. The author states that the object of these paragraphs is to bring before the minds of men who control the affairs of the South, the strongest possible arguments in favor of technical education as a means of developing their resources.

The tables are very complete and cover an unusual variety of engineering data, including: bending moments and shearing force, properties of saturated steam, chimney sizes for boiler horsepower, tensile strains of bolts, calorific values of fuels, draft capacities, logarithms, square and cube roots, areas, specific heats, properties of copper wire, screw thread sizes, equivalent electrical and mechanical units, wiring for circuits and for motor service, as well as interest tables. The advertisements are so worded that they furnish additional information.

Heating and Ventilating. By the late John R. Allen and J. H. Walker. Second edition. Green cloth boards. Three hundred twenty-five 6 x 9-in. pages, numerous illustrations and tables. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City. Price $3.50.

The second edition was written because of the advances in heating and ventilating that have been made during the last few years. Much of the new material was taken directly from Prof. Allen's writings while director of the research laboratory of the American Society of Heating and Ventilating Engineers during the last year of his life. The book is offered as a text-book for use in engineering and architectural schools and as a handbook for the practicing engineer and architect.

For thorough and exact treatment this volume is to be highly recommended. Equal care has been taken with text and illustrations. Beginning with the subject of heat, the methods of heating and kindred subjects are treated including heat losses from buildings, hot-air furnace heating, properties of steam, radiators, steam boilers, steam heating systems, pipe fittings, valves and accessories, steam piping, hot-water systems, temperature control.

That part of the book devoted to ventilation includes the consideration of air and its properties, fan systems for various types of buildings, design of fan systems, airwashers and air conditioning, central heating.

The appendix includes twenty-six tables that give data on coefficients of heat transmission through building materials and static pressure and capacities for fans.

Better Business Libraries. Talks with Executives—By Louise B. Krause, Librarian. H. M. Byllesby & Co., Chicago, The Indexers Press. Cloth; 5 x 7 in.; pp. 98. $1.30

Many valuable suggestions for the formation, arrangement and use of business libraries are given in this volume. The first two chapters deal with the why and the function of business libraries. The next one is a good plea for the employment of trained librarians. There are chapters on books, periodicals, indexes and digests of periodicals, financial and trade services, government publications (unfortunately confined to Federal Government only), library arrangement and putting business libraries to work. The book deserves the careful attention of all business houses that have or ought to have a good library.

Pamphlets Received

Pistons. Aluminum Manufactures, Inc. Cleveland, Ohio. A reference book for dealers, salesmen, garagemen, mechanics and repairmen. It gives many facts concerning aluminum pistons with explanations of all statements made. The subject matter is divided into sections covering functions of the piston, advantages of aluminum pistons, piston troubles, design, machining aluminum pistons and advantages of lynite pistons. The book has a real message to automotive men.

Professional and Business Books: Scovelle, Wellington & Co., Boston, Mass. A very valuable pamphlet compiled by this company, containing a list of 400 books on accounting, engineering and business topics. Considering the great number of such books published today, this selected list should be of great assistance to anyone seeking to procure a library of high-class reading matter.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A government official in Mexico desires to secure the representation of firms for the sale of construction material (iron and steel), wire cable, plates for shipbuilding, rivets, etc. Quotations should be given f. o. b. New York or New Orleans. Reference No. 2023.

A request has been received from a firm in Sweden desiring to purchase and secure an agency for machinery, tools, pipes and fittings and sanitary appliances. Quotations preferred f.o.b. New York. Reference No. 2066.

A merchant from New South Wales, Australia, is in the United States, and wishes to be placed in touch with manufacturers of agricultural machinery, railway equipment, and other lines which would find a market in that country. Reference No. 2099.

Iron works in Palestine desires to purchase and secure an agency for machine tools, small tools, ice-making machinery, and agricultural machinery. Quotations should be given c.i.f. Jaffa. Reference No. 2018.

A mercantile firm in England desires to secure an agency or the sale of machines for mechanically filling and weighing into sacks from the floor level, granular materials, particularly cement. Quotations preferred c.i.f. English port. Reference No. 2026.

An agency is desired by a firm in Italy for the sale of automobiles and motor cycles, typewriters, and calculating machines. Quotations should be given c.i.f. Italian port. Reference No. 2051.

Trade Catalogs

Thermometers and Pyrometers. Arthur Sachsse Corporation, 6 West 32nd St., New York City. Pamphlet describing a line of Keiser & Schmidt thermo-electric remote-control thermometers and pyrometers.

Cleveland Tramrail Systems. Cleveland Crane and Engineering Co., Wickliffe, Ohio A catalog illustrating by a series of folders the working of a Cleveland tramrail system in automatic dipping and painting processes.

Ingersoll-Rand Oil Engines. Ingersoll-Rand Company, 11 Broadway, New York City. Bulletin No. 10,004, describing the Price Type "PO" oil engine. The features of this engine are the shape of the combustion chamber and the arrangement and construction of the spray nozzles used for direct-injection of fuel. The engine is illustrated in various stages of completion, showing the individual important parts.

Cross Gear Tooth Rounding Machine. Cross Gear and Engine Co., Detroit, Mich., Circular describing the gear tooth rounding machine made by this company for rounding spur gears, bevel and spiral gear pinions, and for removing burrs on large gears.

Heat-Treating Equipment. The Brown Instrument Co., Philadelphia, Pa. Circular illustrating use of Brown pyrometers and other apparatus in heat-treating operations of manufacturing plants.

Powdered Fuel Equipment. Grindle Fuel Equipment Co., Harvey, Ill., Bulletin No. 4 containing 40 pages of text and illustrations showing various applications of Grindle powdered fuel equipment.

Flexible Shaft Equipment. The Hergi Manufacturing Co., 250 Fifth St., Bridgeport, Conn. Catalog No. 16, describing a line of flexible shaft equipment especially adapted for grinding and screwdriving mechanisms. Several types are illustrated, as well as parts and special attachments for doing different kinds of work.

Catalogs Wanted

The Foreign Trade Department of the Banca Commerciale Italiana, 62-64 William St., New York City, would like to receive catalogs, price lists, statistics and photographs of American-made aircraft, engines, airships, accessories, materials and supplies.

Forthcoming Meetings

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

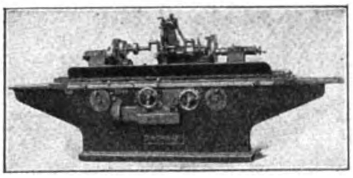
Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

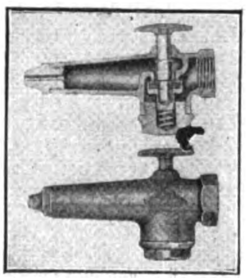
Patented Aug. 20, 1918

Grinding Machine, Automotive Parts, Power or Hand Feed
Cincinnati Grinder Co., Cincinnati, Ohio
"American Machinist," March 2, 1922



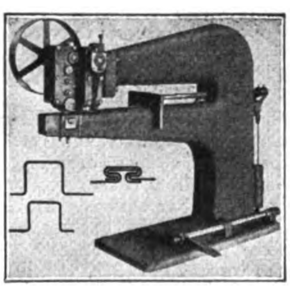
The power-feed machine provides power traverse and automatic reverse to the table, and automatic in-feed to the grinding wheel. The hand-feed machine lacks these, but has fast and slow hand traverse movements. Two back rests with wooden shoes, two adaptors for holding flanged-end cranks, two crankheads, and a universal piston fixture are furnished. For plain cylindrical grinding, footstock and headstock centers, a driving plate and three sizes of driving dogs can be provided. Swing over table, 17 in. Maximum distance between centers, 72 in. Drive, 7 hp. motor. Floor space, 58 x 226 in. Weight, with power feed, 8,030 lb.; with hand feed, 6,600 lb.

Air Gun, Brass
Jenkins Bros., 80 White St., New York, N. Y.
"American Machinist," March 2, 1922



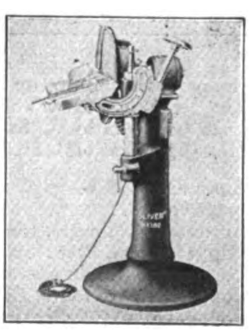
The gun is for use in foundries, machine shops, wood-working and textile mills, electrical stations and garages. The valve, which has a renewable disk, holds tight under pressure and eliminates waste of compressed air from leakage. The disk and seat can be easily removed for cleaning. The air gun is made in ¾ in. size, and with different hose nipples can be used for ⅜, ½, ⅝ and ¾ in. hose.

Seam-Closing Machine, Compound, No. 42
Niagara Machine and Tool Works, Buffalo, N. Y.
"American Machinist," March 2, 1922



The machine is for closing side seams of sheet-metal drums. The work is moved forward along the horn by pressure on the treadle and fed between the first set of rolls. These horizontal rolls squeeze the seams together at the bottom, and feed the work automatically through the machine. The second set of rolls flattens and closes the double-locked seam. The pulley runs at 100 r.p.m. Capacity: maximum length, 42 in.; diameter, 13½ in. Weight, 2,700 pounds.

Sanding Machine, Disk, 15-In., No. 182
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," March 2, 1922

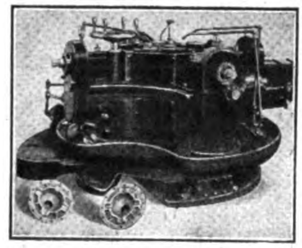


The machine is used chiefly for sanding circular work up to 15 in. in diameter and duplicating work up to 7 in. wide. The disk head contains the disk shaft, the ball thrust bearing, the exhaust fan which deposits the dust within the column, and the removable disk running at a speed of 1,725 r.p.m. The motor, furnished for either direct or alternating current of 110 or 220 volts, is controlled by a push-button. The table can be tilted 45 deg. downward, or 25 deg. upward by a handwheel. Table: size, 9½ x 21 in.; height, 37 in.

Drilling Machine, High-Duty, 20-In., No 23
Foote-Burt Co., Cleveland, Ohio
"American Machinist," March 2, 1922

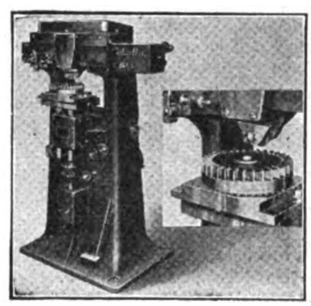
The machine can drive 1½-in. diameter drills in steel. It has nine changes of spindle speed. When the driving pulley runs at 500 r.p.m., the speeds range from 75 to 610 r.p.m. Three changes of feed give feeds of 0.006, 0.012, and 0.026 in. per revolution, controlled by the levers shown on the head. Table: size, 20 x 16 in.; vertical movement, 22 in. Weight, 2,700 lb.

Drilling Machine, Four-Way, Horizontal
Reed-Prentice Co., Worcester, Mass.
"American Machinist," March 2, 1922



The machine drills simultaneously four holes at right angles and in the same plane, and is intended primarily for drilling gear housings for automobile rear axles. Its spindles can be moved simultaneously by a hand wheel. Power feed can be applied to the four spindles simultaneously by means of a lever at the left, and an automatic trip releases it when the drills break through the work. Maximum distance between opposing spindles, 26 in. Distance spindle to table, 6 in. Spindle travel, 3½ in. Height, 49½ in. Width, 85 in. Length, 96 in. Weight, 7,550 pounds.

Marking Machine, Hydraulic, with Circular Table, No. 12
Martin Machine Co., Inc., Turner Falls, Mass.
"American Machinist," March 2, 1922



The machine has recently been equipped for circular marking. The disk or cutter to be marked is placed on the revolving table, which can be adjusted so as to mark at any radius. Power delivered by a belt operates a rotary oil pump. The oil pressure actuates both the vertical table, raising the work to the die, and the horizontal die-holding slide. Travel: slide, ¾ to 7 in.; table, up to 6 in. Height, 50 in. Floor space, 27 x 22 in. Weight, 1,050 pounds.

Saw, Band, Motor-Driven, Portable, 16-In.
J. D. Wallace & Co., 1401 West Jackson Blvd., Chicago, Ill.
"American Machinist," March 2, 1922

The machine is intended for general use in pattern and carpenter shops. The ½-hp. motor runs at a speed of 1,750 r.p.m., driving the saw at a speed of 3,150 ft. per minute. The removable table, mounted on a large rocker bearing, may be adjusted 45 deg. forward or 5 deg. to the rear. All adjustments are made by handwheels or thumbscrews. The wheels carrying the saw are steel disks 16 in. in diameter. Table, 19 x 21 in., 52 in. high. Capacity, 8 in. in thickness. Height, 5 ft. 9 in. Floor space, 15 x 29 in.

Clip, paste on 3 x 5-in. cards and file as desired

The Weekly Price Guide

Rise and Fall of Market

Advances—Tone of copper market stronger; electrolytic quoted in New York at 14⅝c. as against 14½c. Increased supplies of tin on market, quotations reach 32⅛c. as compared with 32¼c. per lb. last week. Zinc market unusually strong; minimum price 6c. per lb., New York warehouses. Lead quiet, firm. Recent rapid advances in prices of lead and lead products causes advance of ¼c. per lb. in red and white lead, both dry and in oil. Both copper and brass sheets and tubing up ¼c.; brass wire up ¼c. and copper wire 1c.; copper rods up ¼c. and brass rods ½c. per lb., New York warehouses. Solder also advanced 2c. Slight rise in copper sheets and old metals in Cleveland.

Declines—Break in flax seed market reflected in raw linseed oil quotations of 88c. as against 91c in New York, and 98c. as compared with $1.04 per gal., 5 bbl. lots, one week ago in Chicago.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.52
Northern Basic	25.02
Southern Ohio No. 2	22.50
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.56
BIRMINGHAM	
No. 2 Foundry	17.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	26.36
Virginia No. 2	28.34
Basic	23.50@25.50
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	22.50@24.00
No. 2 Foundry, Southern, sil 2.25@2.75	24.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	24.16
Basic	25.00
Bessemer	26.96

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.5	5.0	3.0
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Denver	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.40	3.48	3.15	3.38
No. 12	2.45	3.53	3.20	3.43
No. 14	2.50	3.58	3.25	3.48
No. 16	2.70	3.68	3.35	3.58
Black				
Nos. 17 and 21.	3.00	4.15	3.55	4.10
Nos. 22 and 24.	3.05	4.20	3.60	4.15
Nos. 25 and 26.	3.10	4.25	3.65	4.20
No. 28	3.15	4.35	3.90	4.30
Galvanized steel sheets:				
Nos. 10 and 11.	3.30	4.35	3.75	4.30
Nos. 12 and 14.	3.40	4.45	3.85	4.40
Nos. 17 and 21.	3.55	4.75	4.15	4.70
Nos. 22 and 24.	3.70	4.90	4.45	4.85
No. 26	3.85	5.05	4.60	5.00
No 28	4.15	5.35	4.90	5.30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	8.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.81	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.70	4.66	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2.58	2.41	2.38
Soft steel bars (base)	2.48	2.31	2.28
Soft steel bar shapes (base)	2.48	2.31	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.58	2.41	2.38
Bar iron (2.00@2.10 at mill)	2.48	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
³⁄₃₂	8.00		12@13
⅛	6.50		11@12
³⁄₁₆ to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.62½
Tin, 5-ton lots, New York	32.12½
Lead (up to carlots), St. Louis, 5.90; New York	6.25
Zinc (up to carlots), St. Louis, 5.65; New York	6.00

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	6.50	7.50	6.25
Copper sheets, base	20.50	20@21	23.00
Copper wire (carlots)	16.00	16.50	16.25
Copper rods (ton lots)	19.00	21.50	19.50
Copper tubing (100-lb. lots)	22.50	23.00	23.00
Brass sheets (100-lb. lots)	16.75	17.50	18.75
Brass tubing (100-lb. lots)	19.75	19.00	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.75	15.50	15.75
Brass wire (carlots)	17.25	17.75	.....
Zinc sheets (casks)	8.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	....
Solder (½ and ½), (caselots)	23.00	22.00	19.00
Babbitt metal (fair grade)	35.00	42.00	36.00
Babbitt metal (commercial)	15.50	16.00	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	11.75	10.25
Copper, heavy, and wire	12.00	11.25	9.25
Copper, light, and bottoms	10.00	9.50	8.25
Lead, heavy	4.75	5.75	3.65
Lead, tea	4.25	3.50	3.00
Brass, heavy	7.00	6.50	8.00
Brass, light	6.00	5.00	4.75
No. 1 yellow brass turnings	6.50	6.00	5.00
Zinc	3.00	3.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

			New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:					
IC,	20x28,	112 sheets	20.00	18.25	18.50
IX,	20x28,	112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:					
IC,	20x28,	112 sheets	17.00	16.00	17.00
IX,	20x28,	112 sheets	20.00	18.75	19.60
Coke Plates, Bright					
Prime, 20x28 in.:					
100-lb.,		112 sheets	12.50	11.00	14.50
IC,		112 sheets	12.80	11.40	14.80
Terne Plate					
Small lots, 8-lb. Coating:					
100-lb.,	14x20		7.00	5.60	7.25
IC,	14x20		7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb.	.055@.09	.09	.09
Wiping cloths per M., 13½x13½	....	50.00	55.00
Wiping cloths per M., 13½x20½	....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb.	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.88	.95	.98
White lead, dry or in oil	100 lb. kegs.	New York, 12.50	
Red lead, dry	100 lb. kegs.	New York, 12.50	
Red lead, in oil	100 lb. kegs.	New York, 14.00	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville...per net ton		$7.00@$7.25	
Coke, prompt foundry, Connellsville...per net ton		$7.00@$7.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–10%	60–10%	60%
1⅛ and 1¼x3 in. up to 12 in.	60%	60-10-10%	60-10%
With cold punched sq. nuts	40%	....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	......	$4.00 off
Button head bolts, with hex. nuts	30%	$3.90 net	.....
Hex. head and hex. nut bolts	35%	....	65-5%
Lag screws, coach screws	60–5%	....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	45%	60%	50-5%
Bolt ends, with hot pressed nuts	55%	....	55%
Tap bolts, (h.h. plus std. extra of 10%)	15%	....	.....
Semi-finished nuts ⅝ and larger	70%	75–5%	80%
Case-hardened nuts	65%	....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$5.00	$3.50	$3.50
Washers, cast iron, ¾ in. per 100 lb. (net)	5.00	3.50	3.50
Washers, round plate, per 100 lb. Off list	5.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.25	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-10%	70%	60-10%
Rivets, tinned	60-10%	70%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.70	$3.25	$3.00
Cone heads, ditto (net)	3.80	3.35	3.10
1¼ to 1¾-in. long, all diameters, *EXTRA* per 100 lb.	0.25	....	0.15
⅞ in. diameter *EXTRA*	0.15	....	0.15
⅝ in. diameter *EXTRA*	0.50	....	0.50
1 in. long, and shorter *EXTRA*	0.50	....	0.50
Longer than 5 in. *EXTRA*	0.25	....	0.25
Less than 200 lb. *EXTRA*	0.50	....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	......
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40 10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Ala., Montgomery—Janney & Co., founders and machinists, C. L. Carr, Purch. Agt.—sheet metal working machine for pressing small parts about 6 x 12 in.

Cal., Oakland—H. A. Werum, 2150 34th St.—one turret lathe, automatic, with at least 4½ in. hole through spindle.

Ga., Rome—Davis Fdry. & Machine Wks., I. F. Davis, Pres.—one 10 x 14 ft. boring and turning mill.

Ill., Chicago—The Illinois Central R.R., 29 South La Salle St., J. J. Bennett, Purch. Agt.—

Three 18 in., one 20 in., three 24 in. and two 30 in. engine lathes.

One 2½ x 24 in., three 3 x 36 in., one 24-28 in. heavy duty type with 7 in. hole through spindle five 54 in. vertical, four 42 in. vertical, one 15 in. brass and one 15 in. spring turret lathes for miscellaneous brass work.

Four combination axle lathes for turning axles with wheels mounted.

One 54 in. car and one 90 in. driving wheel lathes.

Thirteen 12 or 14 in. x 6 ft. bolt lathes.

One heavy duty type suitable for machining locomotive rods, rod threads and similar parts, one No. 3 vertical and one No. 3 horizontal E type heavy duty milling machines.

One 2 in. double head, one ½ in. triple head and one 2½ in. double head bolt threading machines.

One 1 in. rapid bolt heading, one 2 in. and one 3 in. forging machines.

One heavy duty punch and shear.

One combination punch and shear with capacity to punch and shear plate up to 3-16 in.

Eight 36 in. special railroad draw cut and one 32 in. heavy duty crank shaper.

Two 96 in. 600 ton driving wheel presses.

Three 36-40 in. heavy duty upright drill presses, one 20 in., and one 36-40 in. vertical drill presses.

One 72 in. heavy duty radio drill.

Two Universal reamer and cutter and one guide bar grinders.

Seven 18 x 3 x 1½ in. double floor grinders with 2 grinding wheels.

One twist drill grinder and one 96 in. link grinder for general radius grinding of locomotive links.

One 6 in. metal hack saw.

One set of 6-7 ft. and one set of 6 ft. bending rolls with capacity for bending sheets up to $\frac{5}{16}$ in. in thickness.

One 300 lb. power hammer.

One 56 in. x 18 ft. heavy duty planer with 2 heads on cross rail and 2 side heads.

Two 100 in. vertical boring mills.

One heavy duty type slab miller.

Two 11 lb., one 2,500 lb. and one 5,000 lb. steam hammers.

Four 48 in. car wheel bores.

Two 75 ton forging presses.

Kan., Cheney—E. J. Robinson—forging machinery, forge, set of blacksmiths tools, drill, press, lathe, grinding machine, all power equipment.

Kan., Hutchinson—The Hutchinson Fdry. and Machine Co.—Cincinnati, Norton or Landis grinder, 60 in. between center, 17 in. over carrier, fitted for crank shaft grinding swivel head to permit surface grinding, and an attachment for piston grinding.

Kan., McPherson—Pitts Machine Shop—one power lathe.

Kan., Newton—The Jones Motor Co.—small bench lathe for turning armatures, and one large upright drill with 16 in. travel.

Kan., Wichita—E. L. Billings, 221 South Lawrence St.—complete equipment for garage including drill press, lathe and emery wheel, power driven.

Kan., Wichita—Brown Bros., 217½ West Douglass St.—one power lathe.

Kan., Wichita—De Long Machine Wks. 703 East Murdock St.—one power lathe.

Kan., Wichita—W. Dyer, 229 South Lawrence St. (garage)—drill press, lathe, emery wheel and cylinder grinder for power equipment.

Kan., Wichita—East Central Garage, 923 East Central St., L. J. Campbell, Purch. Agt.—power drill press, emery wheel, and lathe.

Kan., Wichita—J. A. Kammerer, 1016 East Murdock Ave., (auto parts)—one emery wheel and one drill press for power equipment.

Kan., Wichita—H. Loffinger, 118 North Emporia St. (garage)—lathe, drill press and emery wheel for power equipment.

Kan., Wichita—R. McMillian, 204 South Topeka St.—one power lathe.

Kan., Wichita—Wichita Welding & Machine Wks., 200 South Topeka St., P. Eikman, Purch. Agt.—power lathe and drill press.

Mich., Grand Rapids—New Era Spring and Specialty Co., Cottage Grove Ave., S. W.—punch press, back geared, with 5 in. stroke.

Mich., Grand Rapids—Northland Lumber Co.—power shear and punch, with 24 in. throat, to shear 2½ in. bars.

Mich., Saginaw—C. F. Berger, 209 North Water St.—machine shop equipment.

Mo., Kansas City—Solomon & Barnett, 1509 Main St.—small tools for machine shop.

Mo., St. Louis—J. O. Coleman, 106 North 3rd St.—foot power lathe and electric grinders.

N. J., Jersey City—H. E. Cooper, 339 Grand St.—2 presses and rotary slitting shears.

N. J., Mt. Holly—A. Shreve (accessories and repair shop)—foot power screw-cutting lathe and vulcanizing machine.

N. J., Plainfield—W. Woltz, 1244 Arlington Ave.—one rivet, back geared precision lathe.

N. Y., Buffalo—Jerge Motor Co., Inc., 1647 East Genesee St.—equipment for proposed service station and machine shop.

N. Y., Copenhagen—Deer River Power Co., Central Sta.—one portable electric drill, 110 volts; portable forge and blower for field shop.

N. Y., New York—F. and M. Novelty Co., 75 Spring St., S. Marcus, Purch. Agt.—one small size screw machine.

N. Y., New York—The Superior Skylight Co., Inc., 456 4th Ave.—three drill presses, 2 power saws, emery wheels, several vises, 4 combination punch and shears.

N. Y., Watertown—L. Sager Co., Court St.—small lathe suitable for tool room, (new or used).

N. Y., West Falls—W. Reader—machinery, repair tools and equipment for garage now in course of construction.

O., Cincinnati—Economy Mchy. Co., 428 East Pearl St., J. Flynn, Sr., Purch. Agt.—6 small speed lathes 8 in. swing; 2 Brown and Sharpe, small screw machines, (used).

O., Cincinnati—Jones Machine Tool Co., 435 East Pearl St., dealer in used machinery, W. F. Jones, Purch. Agt.—one 14 ft. vertical boring mill, arranged for motor drive, (used).

O., Columbus—Higgy-Avery Co., 1199 Franklin Ave., (radio and electrical apparatus), F. E. Avery, Vice-Pres.—two screw machines, 1 drill press, 2 grinders, and 1 cutting machine.

O., Lima—W. H. Harper, Jr., 1021 West High St.—hand power straight shear for ¼ in. plate.

Pa., Erie—Erie Metal Furniture Co., E. Bauschard, Secy.—Welders, lathes, and miscellaneous machinery for new factory.

Pa., Phila.—Alfred Box Co., Front and Poplar Sts., manufacturers of elevators and hoists—boring machine, drills, riveting machine, small tools etc.

Pa., Phila.—Fidelity Machine & Mfg. Co., 4015 Paul St.—equipment for shop addition.

Pa., Phila.—O. Hoffman, 3rd and Cayuga Sts. (machinist)—several new machines for addition, including boring machine, lathe, etc.

Pa., Phila.—G. W. Lindsay, 5120 Wakefield St.—additional equipment for machine shop.

Pa., Pittsburgh—The Levenson Co., 33 Pride St.—single end punch with architectural jaw to punch holes in ⅜ in. plate.

Pa., Titusville — Titusville Tank and Constr. Co., c/o W. O. Carlson and J. Martin—machinery and equipment to manufacture and repair steel tanks, tank cars, boilers and all kinds of metal plate construction work.

Wis., Iron River—M. Happle—one belt driven lathe mill.

Wis., Kenosha—E. B. Moericke, 915 Salem Ave.—repair machinery for proposed garage.

Wis., Milwaukee—J. L. Austin Mfg. Co., 419 Van Buren St., (hardware specialties and power heads)—machine tools including lathe, drill press, etc.

Wis., Milwaukee—H. E. Krueger, 1040 Holton St.—mechanical baking equipment.

Wis., Milwaukee—Rundle Mfg. Co., 27th and Cleveland Ave. (plumbing fixtures), H. Held, Purch. Agt.—edge grinders.

Ont., Owen Sound—Bd. of Educ., F. H. Rutherford, Secy.—equipment for manual training department, and for physics and chemistry laboratories of proposed technical school.

Ont., Tillsonburg—S. E. Barrett—equipment for garage and auto repair shop now under construction.

Que., Montreal—P. Beaubien, 1675 Masson St.—equipment for garage and repair shop.

Que., Montreal—C. Day, 49 Lincoln Ave.—machinery and equipment for garage and repair shop.

Que., Montreal—A. Fortier, 1875 Cote de Neiges Rd.—bench tools for auto repair shop.

S. A., Para, Brasil—A. de Albuauerque, caixa postal 230—machines for cutlery work, also machines for making axes, hatchets, etc.

Machinery Wanted

Fla., Jacksonville — Florida Fly Exit Screen Co. c/o T. B. Elton, Mgr.—screening and woodworking machinery for proposed factory.

Ga., Rome—Battery Mchy. Co., L. D. Yeargon, Purch. Agt.—one 10 x 10 latest model Ingersoll-Rand belt-driven air compressor (used).

Ill., Chicago—Alemite Die Castings and Mfg. Co., 2640 Belmont Ave.—nickel plating outfit, 6 volts, 2,000 amperes.

Ill., Chicago—M. Lange, 3735 North Whipple St.—cylinder press and job press.

Ill., Freeport—C. E. Meyer & Co., 327 East Spring St.—vinegar presses.

Ill., Oak Park—Oak Park Oak Leaves, 1112-24 North Blvd.—new power cylinder press, linotypes and printing equipment for daily newspaper.

Ia., Des Moines—Des Moines News, The Arcade — newspaper equipment, presses, linotype machines, etc.

Kan., Wichita—The Star, 1241 Wabash Ave., H. T. Simms, Purch. Agt.—one 6 column power cylinder press for newspaper work; prefer Babcock press.

Ky., Franklin—Vi-Car Oil & Refining Co., Inc., J. L. Nimal, Purch. Agt.—machinery and equipment for new refining.

Mich., Detroit — A. Rosenthal, 636 Catherine St. — woodworking machinery suitable for making store fixtures.

Minn., Minneapolis—Ry-Krisp Co., 2120 Lyndale Ave., S., food products, J. G. Priedeman, Secy.—two motors, hangers and shafting, for building now in course of construction.

Mo., St. Louis—Kitlark Electric Mfg. Co., 3940 Easton Ave.—polishing machinery and power equipment.

N. J., Camden—Kleckhofer Container Co., Thorne and Cooperwood Sts., manufacturers of containers—saw tables, cutting knives, moulding machines, riveting machines for paper boxes, and metal working machines.

N. Y., Alleghany—J. Eisert—medium size, power, cream separating machine.

N. Y., Attica—W. Ranger—1 rip saw with table, either wood or iron.

N. Y., Binghamton—T. Snopek, R. F. D. No. 5—machinery and equipment for saw and planing mill.

N. Y., Buffalo—Buffalo Smelting Co., Inc., 12 Peoria St., G. Giesser, pres.—machinery and equipment to smelter and refine copper, brass and other metals, for proposed plant on Tonawanda and Pacific Sts.

N. Y., Buffalo—Buffalo Tool & Supply Co., 20 Henry St.—woodworking machinery.

N. Y., Buffalo—City of Buffalo, Commissioner of Parks and Bldgs., Room 6, Municipal Bldg.—will receive bids until June 12 for refrigeration machines.

N. Y., Buffalo—F. W. Fidler, 19 Lovering Ave.—welding machines.

N. Y., Buffalo—J. W. Kawczynski, 27 LaTour St.—machinery to manufacture ice boxes, show cases, counters and soda fountains.

N. Y., Buffalo—Natl. Biscuit Co., Inc., 217 Ellicott St.—air washing, purifying machinery, heating and cooling devices and electric power plant for new bakery now under construction.

N. Y., Buffalo—L. P. Reimann, 69 North Division St., contractor and manufacturer of ladders—small machinery and equipment for proposed addition to ladder shop.

N. Y., Buffalo—Standard Oil Co. of N. Y., 1103 Elk St.—machinery and equipment for proposed pump house.

N. Y., Buffalo—A. R. Ziebarth, 217 Leroy Ave.—machinery to manufacture wood and metal automobile bodies.

N. Y., Chaumont—Adams, Duford Co., (quarrys), E. B. Johnson, Purch. Agt.—heavy duty swing cut-off saw and limestone rock drills for compressed air operation.

N. Y., Lewiston—Cuyler Packing Co., Inc.—machinery and equipment for new packing house.

N. Y., New York—Erie R.R., 50 Church St., W. R. Collins, Mgr. Purch.—machinery for locomotive repair shops at Hornell, N. Y. List not yet compiled.

N. Y., Niagara Falls—Defiance Paper Co., Walnut and 3rd Sts.—large paper making machine, capacity 30 ton per day, for new $200,000 addition.

N. Y., Rochester—C. F. Dietz, 81½ Adams St.—saw mills, new or used.

N. Y., Rochester—E. T. Gilbert Mfg. Co., 228 South Ave.—1 power paper cutting machine, 32 in. or larger.

N. Y., Rochester—F. E. Wyner, Portland Ave.—small machinery air compressor, etc., for accessory and gas station.

N. Y., Waterloo—Geneva Preserving Co., 59 Swift St.—special machinery and equipment to manufacture and pack sauerkraut.

N. Y., Webster—Webster Co-operative Cold Storage Assn., machinery and equipment for proposed cold storage plant.

N. C., Asheville—Felstone Co., Haywood Bldg.—machinery for the manufacture of concrete blocks and some woodworking machinery.

N. D., Valley City—Valley City Peoples Opinion, W. G. Strieb, Purch. Agt.—printing equipment and book folder.

O., Columbus—Henderson Tire and Rubber Co., Goodale St. and Hocking Valley R.R., C. O. Henderson, Pres. and Mgr.—2 vulcanizing machines.

O., Zanesville—C. Findeiss & Son, Muskingum Ave., (manufacturer of leather)—modern tanning machinery, belt driven.

Pa., Chester—Chester Lace Mills, Clayton and Trainer Sts.—spindles and knitters.

Pa., Marienville—Marienville Express, J. A. Haas, Purch. Agt.—cylinder newspaper press and one 8 x 12 Price job press.

Pa., McKeesport—W. R. Dillon, 1406 Jenny Lind St.—machinery and complete outfit for the manufacture of pop beverages.

Pa., Phila.—G. Barrie & Sons Co., 1313 Walnut St.—equipment for printing plant.

Pa., Phila.—Dearnley Bros. Worsted Co., Chetlen Ave. and Boynton St., J. S. Dearnley, Purch. Agt.—cards, combs, spinning spindles, etc.

Pa., Phila.—C. H. Mastland & Sons, Westmoreland and Collins Sts., (carpet weavers)—broad looms and narrow looms.

Pa., Phila.—A. J. Reach & Co., Tulip and Palmer Sts.—leather working machines, winding machines, small tools, lathe, etc.

Pa., Phila.—Thompson Printing Co., 312 Cherry St.—additional presses and equipment for new plant.

Pa., Phila.—T. Wolstenholme & Sons Co., Frankford Ave. and Westmoreland St.—L. F. Schaeffer, Purch. Agt.—spindles, worsted card and combs.

Pa., Pittsburgh—South Pennsylvania Oil Co., 331 4th Ave.—machinery and equipment for large gasoline plant now in course of construction at Van, Pa.

Pa., Rochester—Amer. Borax Co., Inc., c/o W. C. McKinney, Dir., 6334 Forbes St., Pittsburgh— machinery for the manufacture or cultivating of raw borax.

Pa., Sharon—Star Fdry. and Machine Co., North Water Ave., J. Brahney, Genl. Mgr.—equipment for cast iron and steel foundry now under extensive repairs.

Pa., York—Frick Co. Inc., 48 East Market St.—equipment for new foundry now in course of construction.

Va., Roanoke—White Fdry. Co., 613 10th Ave.—foundry equipment and machinery.

Wis., Cudahy—Bd. of Vocational Educ., J. P. Beuscher, Secy.—equipment and machinery for proposed vocational school.

Wis., Milwaukee—Callaway Fuel Co., 703 North Water St., E. Callaway, Purch. Agt. —motor driven coal handling machinery.

Wis., Milwaukee—C. Hach, 694 Linus St.—mechanical baking equipment, electric motor.

Wis., Milwaukee—The Van Buren Garage Co., Martin and Van Buren Sts.—gas storage tank with pump for proposed garage.

Wis., Niagara—Niagara Journal, R. R. Elliot, Purch. Agt.—typesetting machine.

Wyo., Casper—Mid-Western Torpedo Co., Inc., J. L. Wilson, Genl. Mgr.—special machinery to manufacture nitro-glycerine.

N. S., Halifax—Hillis & Son, 209 Hollis St.—equipment for proposed foundry.

Ont., Tara—Hespeler Novelty Co. Ltd.—equipment and machinery to manufacture novelties.

Ont., Toronto—F. F. Fry, Ltd., 43 Scott St., G. O. McClay, Purch. Agt.—air compressing outfit with drills, also drilling steel.

Mex., Mexicali—Italian Fruit Packing Co., Ltd., J. B. Scolari, Treas.—machinery and equipment for a chain of fruit packing houses to be constructed along western coast of Mexico.

Metal Working Shops

Cal., Merced—The Directors of the Merced Irrigation District will soon award the contract for the construction of a 1 story garage and machine shop. I. W. Hoover, Planada, Archt.

Conn., Stamford—Victor-Page Motors Corp., Farmingtondale, N. Y., has awarded the contract for the construction of a 1 story, 60 x 90 ft. factory addition here, on Melrose St. Estimated cost $30,000. Private plans.

Ill., Chicago—G. S. Kingsley, Archt., 109 North Dearborn St., is receiving bids for the construction of a 1 story, 125 x 150 ft., garage at 3301-3309 North Halsted St., for G. Wittbold Co., 745 Buckingham Pl. Estimated cost $90,000.

Ia., Atlantic—Shranger & Johnson, Inc., manufacturer of lightning rods and specialties, has awarded the contract for the construction of a 1 story factory.

Mass., Cambridgeport—Simplex Wire & Cable Co. has awarded the contract for the construction of a 4 story, 90 x 100 ft. factory addition on Green St. Estimated cost $75,000.

Mass., East Cambridge (Boston P. O.)—Boston & Maine R.R., North Station, Boston, is receiving bids for the construction of a 1 story 80 x 250 ft. repair shop, here. Estimated cost $100,000. A. B. Corthell, c/o owner, Ch. Engr.

Mass., Lowell—Middlesex Machine Co., Paige St., has awarded the contract for the construction of a 1 story, 50 x 75 ft. shop, on Lee St., for the manufacture of plumbing supplies. Estimated cost $20,000. Private plans.

Mass., Salem—The Hygrade Lamp Co., 60 Boston St., has awarded the contract for the construction of a 4 story, 50 x 100 ft. factory. Estimated cost $75,000.

Mass., Westfield—The Foster Machine Co., South Broad St., manufacturer of textile machinery, has awarded the contract for the construction of a 1 story, 80 x 120 ft. addition to its plant, also for 3 other structures, each 30 x 50 ft., for various uses. Estimated cost $40,000.

Mich., Detroit—The Hupp Motor Car Co., East Milwaukee St., is building a 4 story 79 x 400 ft., and a 4 story 52 x 396 ft. addition to its plant on East Milwaukee and Mount Elliott Aves. Estimated cost $200,000. C. D. Hastings, Pres. and Genl. Mgr.

N. J., Belleville—Thompson Machine Co. is receiving bids for the construction of a 2 story factory. Estimated cost $150,000. Fletcher-Thompson, Inc., 542 Fairfield Ave., Bridgeport, Conn., Engrs. and Archts. Incorrectly noted in May 15 issue, under "Melville."

N. J., Camden—W. C. Davis, 731 Hunter St., has awarded the contract for the construction of a 1 story, 45 x 100 ft. garage, at 1388 Haddon Ave. Estimated cost $60,000.

N. J., De Lair—The Kieckhofer Container Co., Thorne and Cooperwood Sts., Camden, has awarded the contract for the construction of a 1 and 2 story container factory, here. Estimated cost $500,000.

N. Y., Buffalo—Hotel Statler, Inc., Washington and Swan Sts., plans to build a garage, 800 car capacity, on Mohawk St.

N. Y., Buffalo—Jerge Motor Co., Inc., 1647 East Genesee St., plans to build a 102 x 105 ft. service station and machine shop. Estimated cost $18,000. Architect not announced.

N. Y., Glendale (Long Island)—V & O Press Co., Dry Harbor Rd., manufacturer of power presses and sheet metal working machinery, will soon receive bids for the construction of a 1 story, 100 x 500 ft. factory addition. Private plans.

N. Y., New York—Dochterman Realty Co., c/o J. M. Felson, Archt. and Engr., 1133 Bway., will soon receive bids for the construction of a 2 story garage at 11 Jane St. Estimated cost $100,000.

N. Y., Syracuse—Gere & Willis, Inc., 320 West Genesee St., plans to build a 60 x 264 ft. garage, service station and repair shop, on West Genesee St. Estimated cost $100,000.

O., Cleveland—The J. L. Free Co., real estate, 1004 Prospect Ave., has had plans prepared for the construction of a 2 story, 110 x 110 ft., garage on Prospect Ave. Estimated cost $75,000. Watoon Eng. Co., Cook Bldg., Archts and Engrs.

O., Cleveland—R. Haldi, 10020 Detroit Ave., has awarded the contract for the construction of a 1 story, 60 x 80 ft. garage. Estimated cost $40,000.

O., Cleveland—The Independent Towel & Supply Co., 1822 Central Ave., is receiving bids for the construction of a 1 and 3 story, 80 x 100 ft. and 70 x 90 ft. laundry and garage, at 1822 Central Ave. Estimated cost $100,000. Christian, Schwarzenbery & Gaeda, 1900 Euclid Ave., Archts.

O., Cleveland—I. Margolin, 10527 Churchill Ave., is having plans prepared for the construction of a 2 story, 50 x 123 ft. garage on East 105th St. Estimated cost $60,000. M. Weis, Union Bldg., Archt.

O., Cleveland—The Ohio Crank Shaft Co., 982 East 152nd St., had plans prepared for the construction of a 1 story, 60 x 200 ft. factory, at 6600 Clement Ave. Estimated cost $60,000. W. J. Wefel, 1836 Euclid Ave., Archt.

O., Cleveland—Sands Mfg. Co., 5407 Sweeney Ave., has awarded the contract for the construction of a 2 story, 65 x 100 ft. factory for the manufacture of water heaters, on East 55th St. and Sweeney Ave. Estimated cost $40,000. Private plans.

O., Cleveland—The York Ohio Ice Machine Co., 1106 Woodland Ave., has had plans prepared for the construction of a 1 and 2 story, 100 x 132 ft., office, warehouse and factory on West 28th St. and Washington Ave. Estimated cost $60,000. E. McGeorge & A. G. Simon, 1900 Euclid Ave., Archts.

O., Euclid—O. E. Brown, c/o Elf Motor Co., 7000 Euclid Ave., Cleveland, is having plans prepared for the construction of a 1 story garage. Estimated cost $40,000. Private plans.

O., Lakewood (Cleveland P. O.)—W. C. Schultz, 11913 Detroit Ave., will soon award the contract for the construction of a 1 story 76 x 97 ft. garage and commercial building, on Detroit and Love Aves. Estimated cost $40,000. O. N. Chamberlin, 1532 Spring Garden Ave., Archt.

Pa., Bradford—Bradford Refining Co. has awarded the contract for the construction of a refinery on Foster Brook. Estimated cost $50,000. L. E. Mallory, Jr., Newell Bldg., Secy. Private plans.

Pa., Enola—Pennsylvania R.R., Broad St. Sta., Phila., will soon receive bids for the construction of a 1 story 100 x 600 ft. repair shop, here. Estimated cost $500,000. A. C. Shand, Ch. Engr.

Pa., Phila.—The Commercial Truck Co., Hunting Park and Rising Sun Ave., has awarded the contract for the construction of a 3 story, 160 x 175 ft. garage and service station on Franklin Sq. Estimated cost $500,000.

Pa., Phila.—H. S. French, c/o P. H. Tyre, Archt., 1509 Arch St., will soon receive bids for the construction of a 5 story, 80 x 100 ft. sales and service station on Girard and Frankford Aves. Estimated cost $250,000.

Pa., Phila.—G. W. Lindsay, 5120 Wakefield St., has awarded the contract for the construction of a 2 story, 40 x 100 ft. machine shop at 5116 Wakefield St. Estimated cost $35,000. H. N. Miller, 34 South 17th St., Archt.

Pa., Phila.—Philadelphia Trainrail Co., 109 East Tusculum St., has awarded the contract for the construction of a 1 story, 60 x 90 ft. factory, for the manufacture of switches and frogs, on Ontario and Weckel Sts. Private plans.

Pa., Pittsburgh—Fleischmann Co., 701 Washington St., New York City, is having plans prepared for the construction of a 2 story, 75 x 175 ft. garage, warehouse and office building on Allegheny and Western Sts., here. Estimated cost $50,000.

Pa., Pittsburgh—Jones & Laughlin Steel Co., 3rd Ave. and Ross St., is having plans prepared for the construction of a 1 story, 200 x 200 ft. roll plant, machine shop and polishing plant, on South 27th and 28th Sts. D. L. McKeel, c/o owner, Engr.

Pa., Primos—Jones Machine Wks., 53rd St. and Landsdown Ave., Phila., has awarded the contract for the construction of a 1 story, 60 x 200 ft. machine shop, here. Estimated cost $50,000. Private plans.

Pa., Titusville—Titusville Iron Wks. Co., plans to build a large foundry. Estimated cost $40,000. Private plans. J. W. Boone, Secy. and Treas.

Pa., Williamsport—C. F. Dietrick, Windsor Café, Pine St., plans to build a 2 story, 90 x 150 ft. garage and repair shop on Hepburn St. Estimated cost $100,000.

R. I., Providence—The Winsor & Jerauld Mfg. Co., 223 Harrison St., manufacturer of textile machinery, has awarded the contract for the construction of a 1 story, 50 x 150 ft. and 20 x 60 ft. addition to its factory, on Harrison St. Estimated cost $40,000.

Wis., Appleton — Wisconsin Traction, Heat, Light & Power Co., is taking bids for the construction of a 1 story, 50 x 86 ft. garage and service station. Estimated cost $45,000. D. C. Beaulieu, Appleton, Engr.

Wis., Kenosha—E. B. Moericke, 915 Salem Ave., is receiving bids for the construction of a 1 story 50 x 125 ft. garage. Estimated cost $50,000. Private plans.

Wis., Milwaukee—Nash Motors Co., Clement Ave., has awarded the contract for the construction of a 3 story, 100 x 400 ft. addition to its factory. Estimated cost $250,000. Private plans.

Wis., Milwaukee—Van Buren Garage Co., Martin and Van Buren Sts., has awarded the contract for the construction of a 1 and 2 story 90 x 126 ft. garage. Estimated cost $65,000.

Wis., Racine—Belle City Incubator Co., 15th St., has awarded the contract for the construction of a 2 story, 60 x 85 ft. factory for the manufacture of incubators. Estimated cost $25,000. J. Robar, Pres. Private plans.

Wis., Waukesha—The Spring City Auto Co., 220 West Main St., is having revised plans prepared for the construction of a 1 story, 34 x 150 ft., addition to its garage. Estimated cost $40,000. M. F. White, 68 Wisconsin St., Milwaukee, Archt.

N. S., Halifax—Hillis & Son, 209 Hollis St., has awarded the contract for the construction of a foundry. Estimated cost $50,000. Engineer not announced.

Ont., Port Colborne—The International Nickel Co. of Canada, Ltd., is receiving bids for the construction of a 1 story, 94 x 384 ft. electrolytic nickel refinery. J. T. Kemp, Asst. Genl. Mgr.

Ont., Tillsonburg—S. E. Barrett is building a garage and auto repair shop. Estimated cost $42,000.

General Manufacturing

Cal., Colusa—California Prune and Apricot Growers, Market and San Antonio Sts., San José, are having plans prepared by their engineering and construction dept., A. Grubb, in charge, for the construction of a 1½ story packing plant on Coopers Extension Tract, here. Estimated cost $125,000.

Ill., Chicago—Roberts & Oakes, 141 West Jackson Blvd., plans to build a packing plant on 45th St. and Racine Ave. Estimated cost $500,000. Architect not selected.

Me., Lewiston—The Lewiston Bleachery & Dye Wks., Lisbon St., will soon award the contract for the construction of a 3 story, 40 x 110 ft., addition to its sheeting department. Estimated cost $45,000. Private plans.

Me., Pittsfield—Amer. Woolen Co., Lawrence, Mass., wil soon award the contract for the construction of a 3 story 50 x 90 mill addition, here. Estimated cost $40,000. Private plans.

Me., Rumford—The Oxford Paper Co., has awarded the contract for the construction of a 2 story addition to its plant. Estimated cost $50,000.

Mass., Easthampton — Hampton Co., Pleasant St., has awarded the contract for the constructon of a 5 story, 70 x 100 ft. addition to its cotton mercerizing plant. Estimated cost $300,000.

Mass., Newton—Shepherd Worsted Mills has awarded the contract for the construction of a 1 story, 45 x 145 ft. dyehouse on California St. Estimated cost $35,000. Private plans.

Mass., North Andover—Suttons Mills will soon award the contract for the construction of a 1 story, 70 x 105 ft. (worsted) weave shed. Estimated cost $35,000. The Russell Co., 50 State St., Boston, Plant Mgrs.

Minn., South St. Paul—R. N. Katz Packing Co., South St. Paul, and 352 East 6th St., St. Paul, is having plans prepared for the construction of a 3 story, 50 x 130 ft. packing plant and a 1 story, 34 x 36 ft. office building. Estimated cost $100,000. Henschien & McLaren, 37 West Van Buren St., Chicago, Archts.

N. H. Laconia—The Pitman Mfg. Co. has awarded the contract for the construction of a 3 story, 65 x 100 ft. dyehouse for textile plant. Estimated cost $60,000.

N. J., Camden—Haddon Press Co., New Park Ave. and Whitehorse Pike, has awarded the contract for the construction of a 1 story, 90 x 440 ft. printing plant, on 19th and Federal Sts. Estimated cost $225,000.

N. Y., Alden—Erie County, Court House, Buffalo, is having plans prepared for the construction of various buildings including administration building, shop, laundry, bakery, women and juvenile buildings, on the County Farm, here. Estimated cost $150,000. G. Diehl, Ellicott Sq., Buffalo, County Engr. W. J. Beardsley, c/o County Engineer, Archt.

N. Y., Clyde—A. D. Collier plans to build a cold storage plant of 60,000 bbl. capacity. Estimated cost $180,000 to $200,000. Architect not selected.

N. Y., Newark—Phillips-Werth Optical Co., Rochester, N. Y., has awarded the contract for the construction of a 1 story 52 x 175 ft. optical factory on North Main St.

N. Y., Palmyra—Meadowbrooks Products Co., Inc., extracts and toilet preparations, C. B. Beal, Purch. Agt.—small machinery for manufacture of extracts.

N. Y., Yonkers—Alexander Smith & Son, Elm Ave., has awarded the contract for the construction of a 4 story, 16 x 206 ft. addition to its plant for the manufacture of carpets. Estimated cost $300,000.

N. Y., Webster—Webster Co-operative Cold Storage Assn., has awarded the contract for the construction of a 4 story cold storage plant.

N. C., Asheville—Felstone Co., Haywood Bldg., will soon receive bids for the construction of a 1 story, 50 x 100 ft. factory for the manufacture of concrete blocks, etc. Estimated cost $15,000-$18,000. Private plans. W. L. Gravatt, Secy.

O., Canton—The Hygienic Products Co., 715 Walnut St., S. E., manufacturer of cleaning powder, has awarded the contract for the construction of a 2 story, 50 x 70 ft. factory. Estimated cost $40,000. Noted June 1.

O., Cleveland—The Ingraham Waste & Supply Co., 1539 Columbus Rd., plans to construct a 2 story, factory and warehouse at 1450 Hamilton Ave. Estimated cost $50,000. Architect not selected. W. E. Monsor, Pres.

O., Cleveland—Rothkopf Bros., 6112 Central Ave., will soon award the contract for the construction of a 2 story 36 x 130 ft. dairy at 10712 Superior Ave. Estimated cost $75,000. A. Sogg, 319 Hippodrome Bldg., Archt.

O., Cleveland—The Ward Baking Co., c/o J. B. Arthur, St. Marys St. and Southern Blvd., New York, has awarded the contract for the construction of a 3 and 5 story, 240 x 315 ft. bakery on East 45th St. and Windsor Ave., here. Estimated cost $500,000. Noted March 23.

O., Dayton—The Dayton Biscuit Co., Webster St., has awarded the contract for the construction of a 3 story, 75 x 90 ft. factory. Estimated cost $75,000.

O., Eaton—Eaton Farmers Equity Co. has awarded the contract for the construction of a grain elevator and mill. Estimated cost $17,500.

O., Youngstown—The Ward Baking Co., St. Marys St. and Southern Blvd., New York, has awarded the contract for the construction of a 3 story, 114 x 231 ft. bakery, here. Estimated cost $250,000. Noted April 6.

Pa., Chester—Chester Lace Co. has awarded the contract for the construction of a 1 story, 60 x 80 ft. lace factory. Private plans.

Pa., McKees Rocks—The Chesebrough Mfg. Co., 17 State St., New York City, is having plans prepared for the construction of a 2 and 3 story, 143 x 195 ft. plant for the manufacture of vaseline, consisting of 7 buildings, including power house, boiler house, warehouse and manufacturing buildings. Estimated cost $500,000. Hunting Davis Co., Century Bldg., Pittsburgh, Archts.

Pa., Phila.—H. Barton & Sons Co., 109 South 3rd St., will soon award the contract for the construction of a 2 story, 40 x 105 ft. factory, for the manufacture of sand paper and abrasives, in the Holmesburg Dist. Estimated cost $25,000. Tilden & Register, 1525 Locust St., Archt.

Pa., Phila.—The Deamley Bros., Chester Ave., has awarded the contract for the construction of a 3 story, 74 x 98 ft., spinning factory on Chester Ave. and Boynton St. Noted April 27.

Pa., Phila.—Sax & Hilbert, Engrs., Penfield Bldg., will soon receive bids for the construction of a 4 story, 100 x 133 ft. factory, for the manufacture of sporting goods, on Memphis and Eyre Sts., for A. J. Reach Co., Tulip and Palmer Sts. Estimated cost $200,000.

Pa., Phila.—Thompson Printing Co., 312 Cherry St., has awarded the contract for the construction of a 5 story, 80 x 120 ft. printing plant, at 1127 Callowhill St. Estimated cost $200,000. Ballinger Co., 12th and Chestnut Sts., Archts.

Pa., Rochester—Amer. Borax Co., Inc., c/o W. C. McKinney, Dir., 6334 Forbes St., Pittsburgh, plans to build a 3 story, 400 x 600 ft. borax factory. Estimated cost $150,000. Architect not announced.

Pa., Rochester—Davies Ahrens McKiney Co. is having plans prepared for the construction of a 1 story 30 x 50 ft. power plant and two 3 story 50 x 100 ft. factory buildings, for the manufacture of boracic acid. Estimated cost $90,000. Austin Co., 16112 Euclid Ave., Cleveland, O., Engrs.

Pa., Washington—Observer Publishing Co. is having revised plans prepared for the construction of a 2 story, 60 x 150 ft. printing plant on Main St. Estimated cost $150,000. W. L. Stoddard, 9 East 40th St., New York City, Archt.

R. I., Woonsocket—The Peerless Dyeing & Finishing Co., c/o Woonsocket Spinning Co., plans to construct two 1 story dye houses on Fairmount St. Estimated cost $50,000. Private plans.

Wis., Racine—Wright Rubber Products Co. has awarded the contract for the construction of a 1 story, 60 x 120 ft. rubber factory on Lazard St. Estimated cost $40,000. Private plans.

Ont., Hamilton—Firestone Tire & Rubber Co., South Main St., Akron, O., will soon receive bids for the completion of a tire and rubber factory, here, 3,500 tires daily capacity. Private plans.

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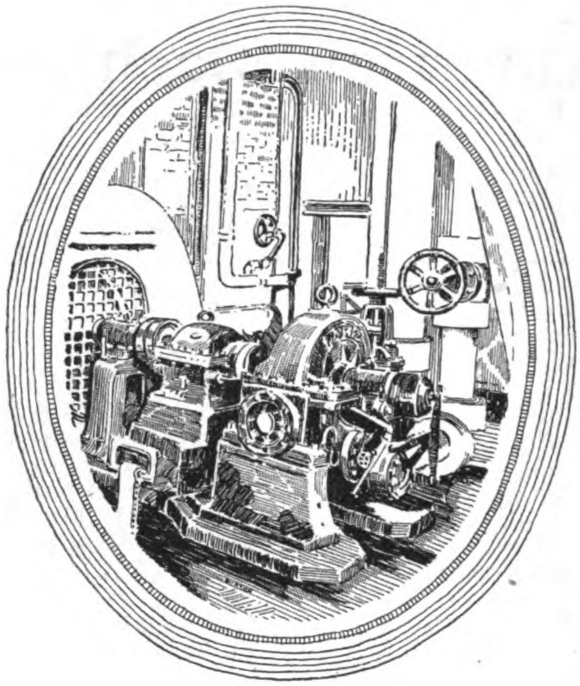

The High-Grade Steam Turbine

The old-fashioned reciprocating steam engine has had to give way to the steam turbine in many cases. More compact, and requiring less floor space, it saves in the rental value of land occupied.

More and better workmanship is also required, which, of course, adds to the cost on a pound basis, and gets more into the machine tool class. But we must never forget that all the accuracy secured depends primarily on the quality of the machine tools that build the turbines.

Just as an example—a high-grade 250 H.P. non-condensing turbine costs approximately $3000, while a condensing unit runs up to $6,000. The first weighs about 4500 lbs., the latter 10,000 lbs., about 66 cents per pound in the small machine—60 cents in the large one.

Here we have more of a comparison than with most other cases. It's a high grade, accurate product. And don't forget to notice that the pound price is higher than with most machine tools. The highest price engine lathe is about 42 cents a pound, the lowest about 30 cents. Boring mills, milling machines, shapers, etc., run from 25 to 31 cents, and mighty few machine tools come up to 60 cents a pound.

But—

When you buy machine tools—you buy production—not pounds

American Machinist, New York

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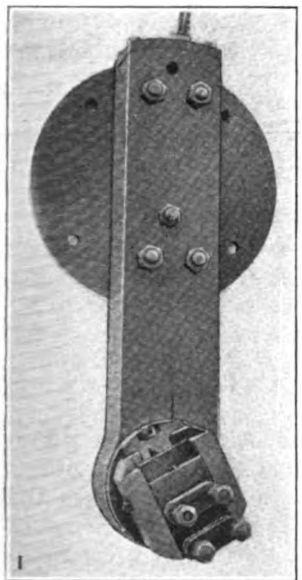
Volume 56 NEW YORK, JUNE 15, 1922 Number 24

Tools in a Virginia Railroad Shop

Special Planing Tools—Gages Made on a Boiler-Shop Punch—Testing Pneumatic Drills—A Home-made Machine for Grinding Links

BY S. ASHTON HAND
Associate Editor, *American Machinist*

LOCOMOTIVE driving boxes cannot be bored to receive the crown brasses on account of the lips necessary to retain the brasses. They are often machined on a slotter or shaper but these tools can only handle one box at a time, requiring a new set-up for each box. The planer, however, is an ideal machine for this operation providing the proper tools are furnished, as the boxes can be set up in a string of as many as the table will hold. A tool for planing driving boxes is shown in Fig. 1. It is attached to the planer saddle by the bolts that hold the swiveling plate, that part having been removed. At the lower end is a worm-driven plate on which is mounted a sliding toolblock fitted with the conventional clapper and box. The toolblock can be revolved by hand by applying a crank to the squared end of the worm shaft at *A* or by power through a miter gear on the worm shaft meshing with a like gear in the saddle and used in the regular down feed. The feed for depth of cut is controlled by a capstan-headed screw on the tool slide. Details of this tool are given in Fig. 2.



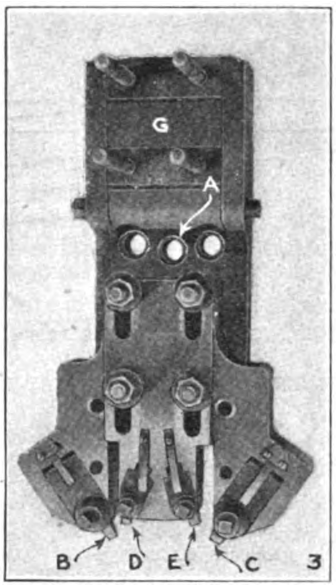


FIG. 1. TOOL FOR PLANING CROWN-BRASS SEATS IN DRIVING BOXES. FIG. 3. TOOL FOR PLANING SHOES AND WEDGES

Another job to which the planer is admirably adapted is that of machining shoes and wedges. Here, with suitable holding fixtures, they can be strung out in quantities limited only by the length of the planer table. A tool for planing shoes and wedges is shown in Fig. 3. It is attached to the toolslide in place of the apron and clapper box and is arranged to swivel on a stud at *A*. The two tools *B* and *C* take cuts on the outer edges of the work while those at *D* and *E* take their cuts on the inner edges, the feed, of course, being downward. The toolposts are mounted in individual spring-actuated clappers.

It will be noted that the block carrying the tools is a separate piece from the main body of the device to which it is attached by four studs, so that it can be removed for the substitution of other toolholding blocks, and that slots are provided for vertical adjustment. For traversing cuts, the whole arrangement can be revolved 180 deg., presenting to the work a tool held in the clapper *G*.

MACHINING CROWN BRASSES

Machining the outsides of crown brasses to fit driving boxes can be done in the lathe, vertical boring mill, slotting machine or shaper, but the vertical boring-mill, owing to the ease in mounting and locating the work and in the adjustment of the tools is, perhaps, the most satisfactory machine for the purpose. A fixture for holding crown brasses for machining in a vertical boring-mill is shown in Fig. 4. Bolts through the slots to be seen in the base hold the fixture to the machine table, while the work is held between the checkered plates above and below.

Clamping is done by the nut shown at the top of the central stud augmented by cup-pointed setscrews in the upper plate. The upper plate is reversible to accommodate brasses of more than one size without interfering with the tool at the start of the cut.

Piston rings are cut from a pot casting that has been bored and turned to the proper diameters. Five rings are cut off at, or almost at, the same time by the multiple tool shown in Fig. 5, in which the tools vary enough in length to part the first ring a little ahead of the second and so on progressively through the lot. The cutting tools are of the circular type, mounted on gear segments and clamped in adjustment by the nut *A*. The tools are not removed from the holder for grinding but are all ground as a unit. Adjustment for height of points is made by revolving the toothed segments by means of a wide faced pinion operated by a socket wrench through the hole *B*. After adjustment the wedge *C*, bearing on the pinion shaft, is drawn tight by a nut underneath, holding both pinion and segments from movement.

Tire-turning tools are forged to shape in dies and mounted in holders such as shown in Fig. 6. The upper edges of the tools are forced up around the contour in forging so they may readily be sharpened by grinding on the top. The holder has recesses in the top and bottom so that both the tools shown in the illustration

can be mounted in the one holder and either one brought into service by turning the holder over.

A set of tools for cutting small gaskets, or washers from sheet packing is shown in Figs. 7 and 8. The blanking and piercing dies are in the base of the tool at *A*, Fig. 7, and the blanking and piercing punches are shown at *B* and *C* respectively. The sheet packing is entered in the slot *D* and after blanking the gasket,

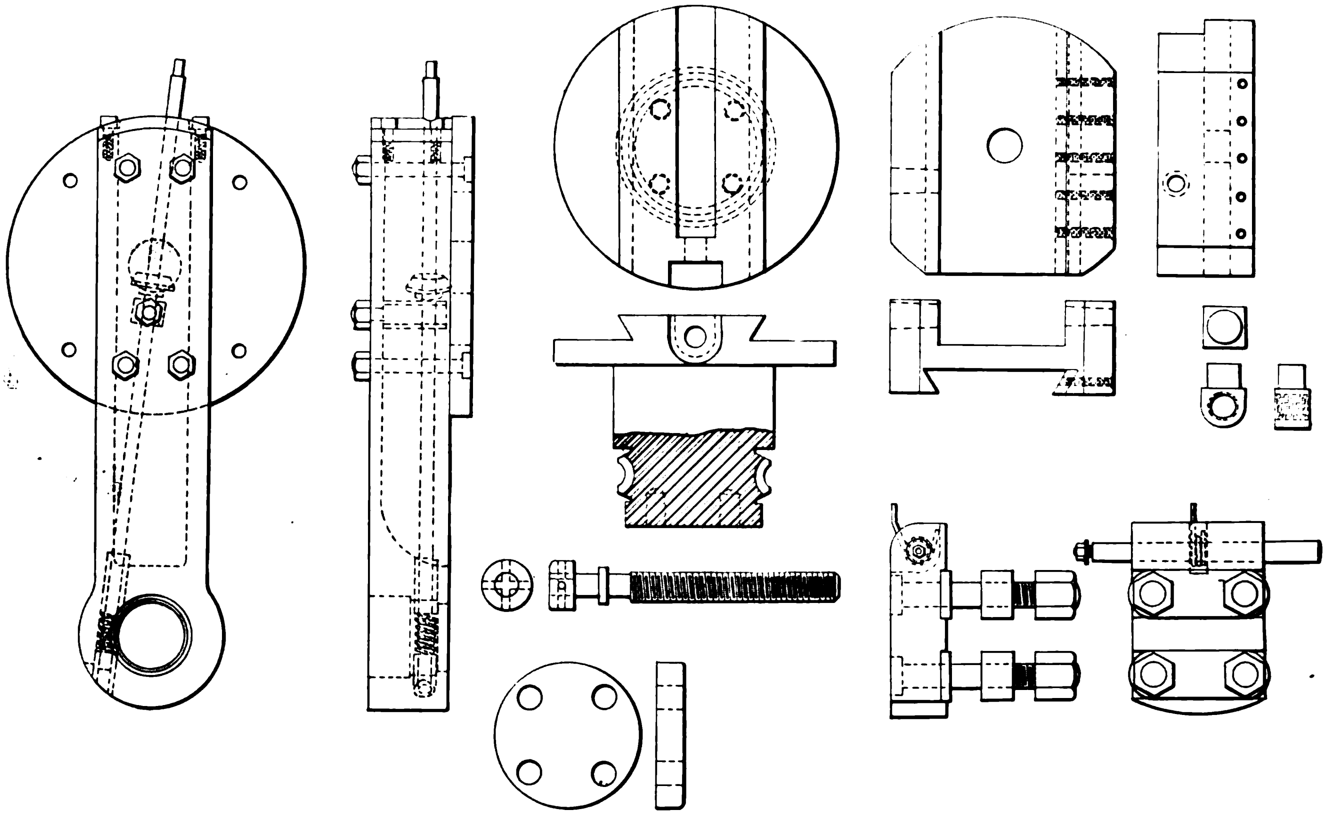


FIG. 2. DETAILS OF TOOL SHOWN IN FIG. 1

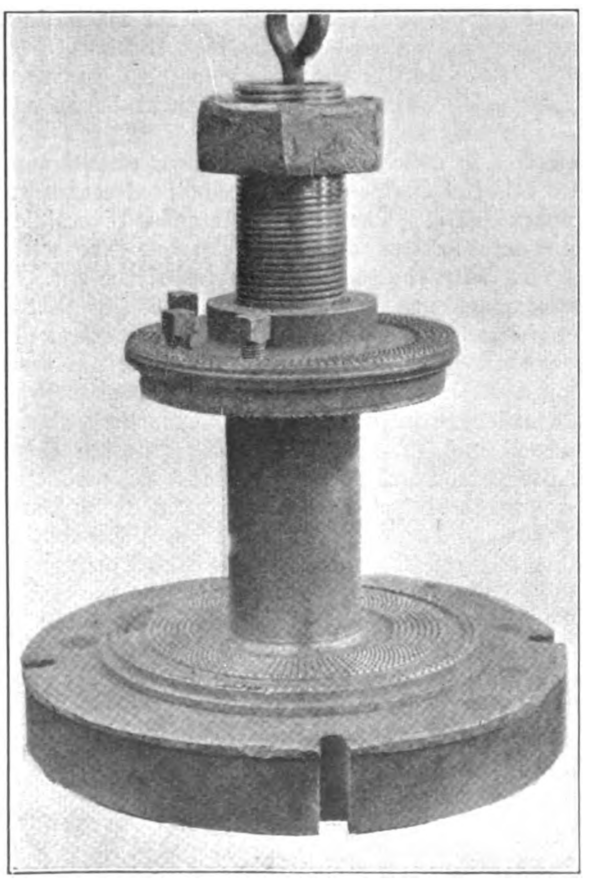


FIG. 4. FIXTURE FOR HOLDING CROWN BRASSES

the punch *B* carries it down and holds it on the piercing die. The punch *C* fits inside the blanking punch and, on being forced down by the handle, pierces the gasket. Fig. 8 shows the tool assembled and some of the gaskets cut by it. While production by a combination die in a punching machine would be much greater, the limited demand for the gaskets can be supplied by this simple and inexpensive tool and one of the tool-

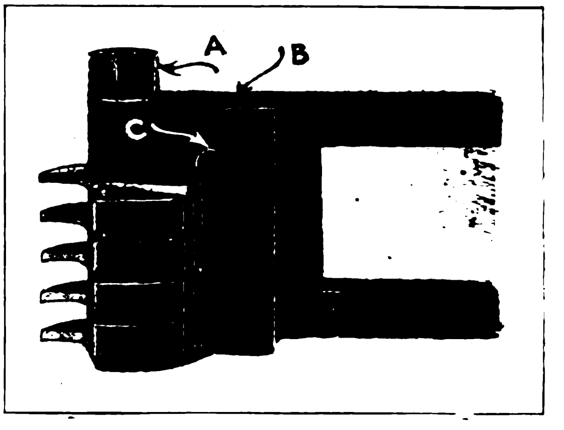


FIG. 5. MULTIPLE TOOL FOR CUTTING OFF PISTON RINGS

crib attendants can cut all that are needed in his spare time.

Master Car Builders' gages for wheel defect, worn journal collars and journal fillets are supplied to a large number of employees and, with the exception of those used by shop foremen do not need to be extremely

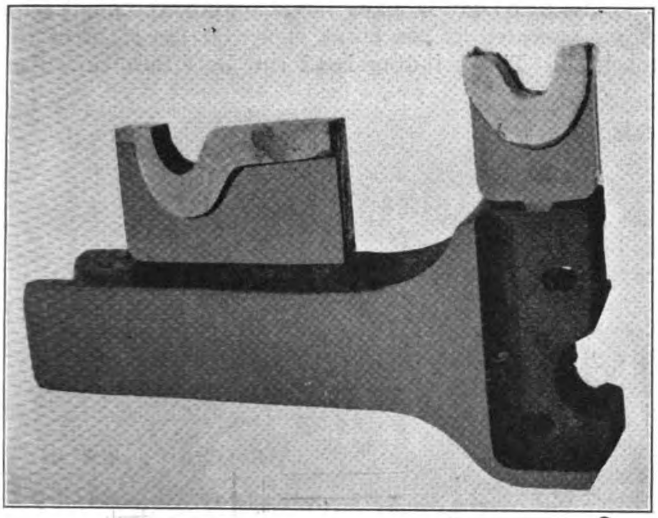
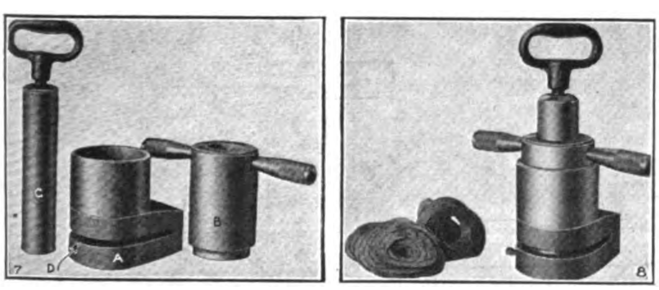


FIG. 6. TIRE TURNING TOOLS

accurate. Gages for distribution to outside men are punched out of sheet steel by the tools shown in Fig. 9, at a cost of a few cents each and answer all the purposes of hardened and ground gages costing several dollars each. One of the gages punched is shown at *A*.

The die is set in a block having a box guide in which the punch holder fits. The reason for this construction is that the tools are used in one of the boiler shop presses in which the ram is not guided with sufficient accuracy for work of this kind.

Portable air drills are tested for efficiency at stated times in the apparatus illustrated in Fig. 10. The spindle of the drill *A* rests on the plunger of an oil cylinder connected to gage *B*. Pressure similar to that of drilling is applied by the screw *C* operated by hand wheel *D*. Air is supplied from the line through the tank *E*. The efficiency of the drill is noted by the amount of air consumed as shown by the "tool-o-meter" *G* in connection with the pressure on the air line registered by gage *H* and the drilling pressure shown on gage *B*. Comparing these readings with readings taken from new drills gives a very good indication as to whether or not a drill needs overhauling.



FIGS. 7 AND 8. TOOLS FOR PUNCHING GASKETS

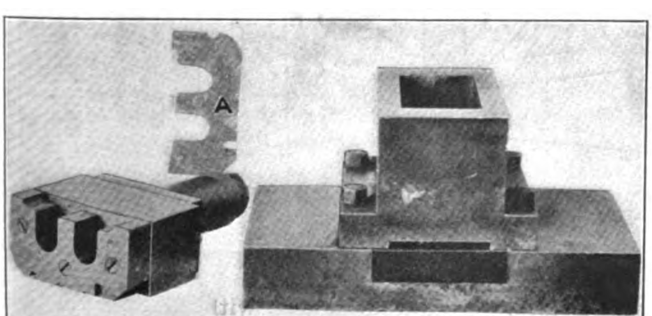


FIG. 9. TOOLS FOR PUNCHING M. C. B. GAGES

Repaired drills are tested in this apparatus to see if the repairs have been properly made.

In making and repairing seats for pipes taking steam from the dry pipes to the cylinders the general practice is to use spherical reamers. Such tools are expensive both as to first cost and upkeep. The device shown in Fig. 11 will machine spherical seats in all sizes of dry pipes to be found on locomotives. In use, the spool

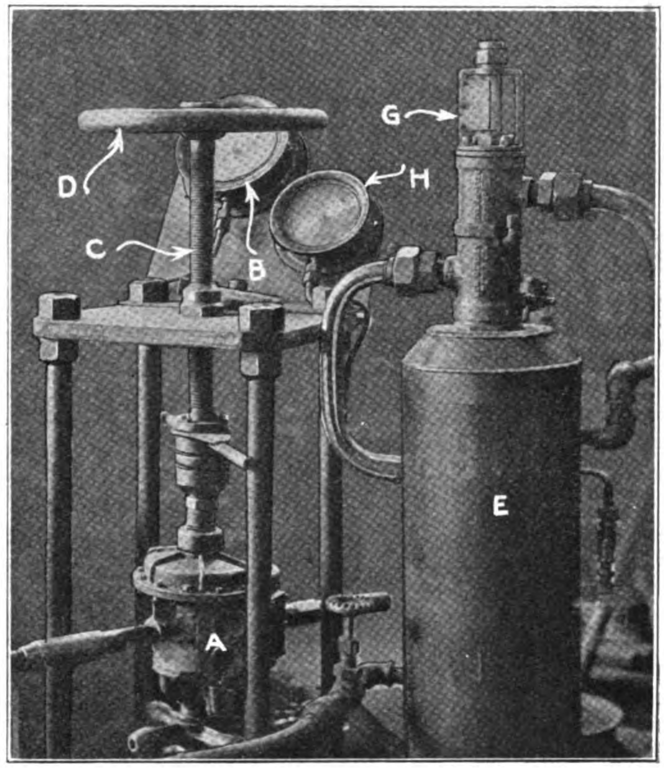


FIG. 10. DEVICE FOR TESTING AIR DRILLS

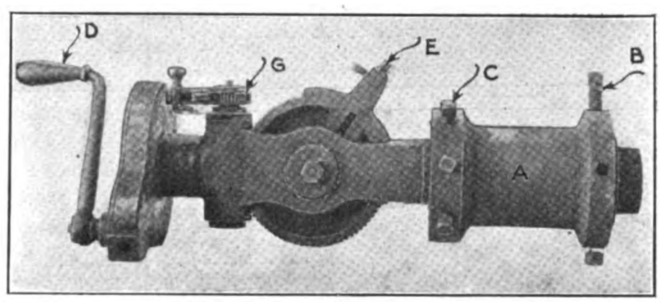


FIG. 11. DEVICE FOR SPHERICAL SEATING

A is inserted in the dry pipe where it is centered by the screws *B* and securely held by screwing out the screws *C*.

The device is rotated on its axis by means of the crank *D*, the inner part of the spool acting as a bearing. As the tool *E* is swept around the seat, it is given an intermittent circular motion in a direction at a right-angle to the axis of the device through worm gearing actuated by the ratchet *G*. The ratchet can be operated by hand, or automatically by a stop clamped to any convenient part of the boiler or smoke box, a helical pull-spring returning the pawls to the starting position after each movement. Seats of any radius within the range of the device can be made by adjusting the position of the tool in relation to its center of rotation. As arranged, the device is intended to be operated by hand, though there is no reason why it cannot be easily arranged for operation by a motor.

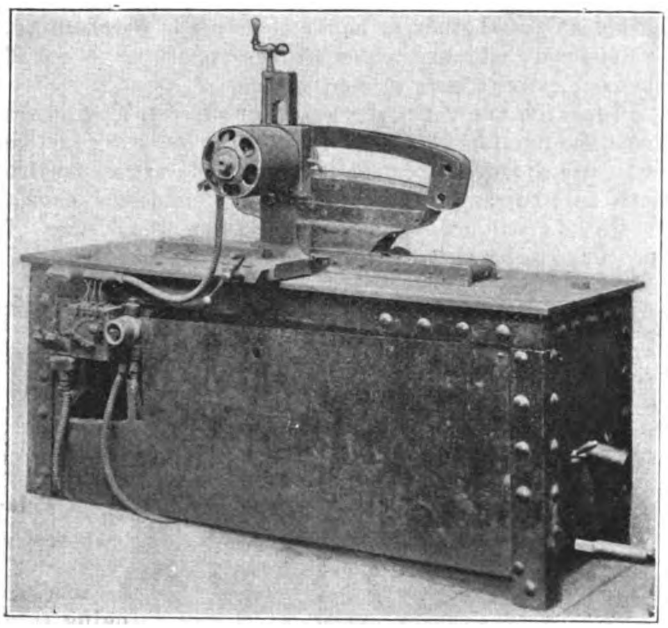


FIG. 12. HOME-MADE LINK GRINDING MACHINE

A very compact, home-made machine for grinding valve-motion links is shown in Fig. 12 and in detail in Fig. 13. The link is clamped to the carriage which oscillates on bars set at an angle. The angle to which the bars are set determines the grinding radius of the link and provision is made for changing this angle by a screw operated by the crank shown at the right of the machine. The grinding head can be either raised or

FIG. 14. CAUTIONARY NOTICE ON MACHINE TOOLS

lowered by a micrometer screw. The wheel runs at 5,400 r.p.m. and has a traverse across the link of 4 in. As originally constructed the oscillating motion was operated through a reversing screw, the traveling nut being connected to the carriage by a swinging connecting rod and all motions were driven by belt from a single motor. Alterations have since been made so that the carriage is now oscillated by a crank motion from

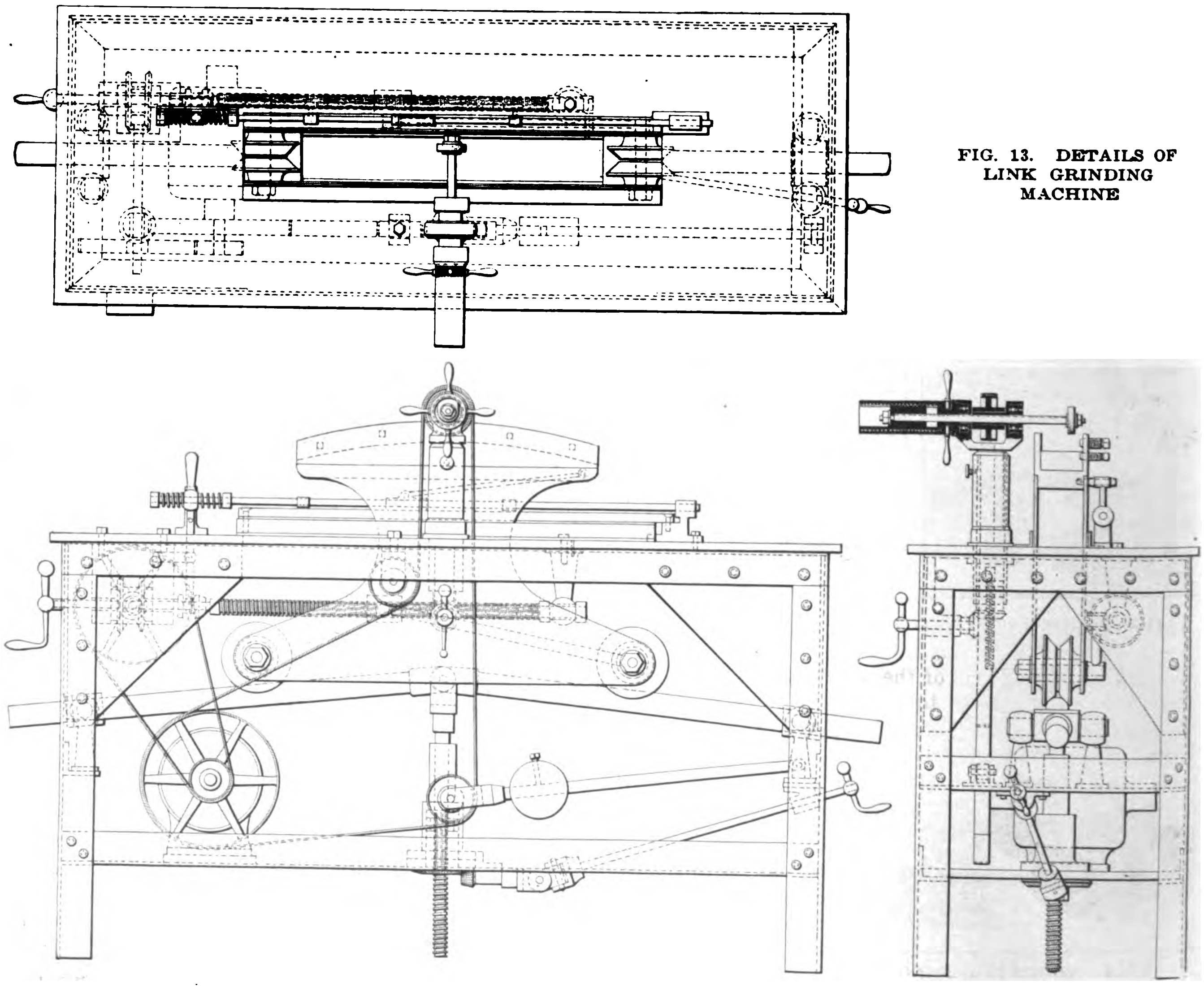


FIG. 13. DETAILS OF LINK GRINDING MACHINE

one motor while the wheel is driven by another motor mounted on the grinding head.

The tools and appliances illustrated and described in this article were made in the shops of the Chesapeake & Ohio Railway, Clifton Forge, Va., where they are in constant use.

That "Safety First" is uppermost in the minds of the management of this shop, is evidenced by the fact that every machine on the premises has stencilled on it in large white letters the cautionary notice shown in Fig. 14.

Super-Standards

BY FRANK B. AND L. M. GILBRETH

The value and importance of standards and of standardization as factors and causes of cost reduction is generally acknowledged by all people today, both inside and outside the industries, who have given both the theory and the practice proper investigation and study.

Dr. Taylor was a firm advocate of standardization as applied not only to tools, appliances and implements, but also to methods, and we desire to acknowledge our appreciation of the great value of the Taylor philosophy and our emphasis on super-standardization due to Dr. Taylor's emphasis on standardization.

Mr. Cooke's definition of a standard as "a carefully thought out method of performing a function, or carefully drawn specification covering an implement or some article of stores or of product" is undoubtedly the best definition to date, but it embodies a thought that is quite different from that which we are emphasizing in considering the subject of super-standardization. The super-standard is the *best known* method of performing a function, etc., attained through the use of the best known units, methods and devices of research. The principle is the same for all standards, but the difference in the degree of refinement of method brings about differences in results that are comparable with the usual results of important inventions.

The super-standard is a logical growth of management as a science. It supplements and does not supersede the standard which remains accepted practice during the transitory or installation period. Standardization has great significance from the management, the economic, the psychological and even the psychiatric standpoint. This is evidenced by the fact that it is universally advocated by management men; that it is endorsed and recommended in the report of the Committee of Waste in Industry; that it is estimated as one of the most important elements of scientific management by present day psychologists and appreciated as a possible solution of certain cases of mal-adjustment by the progressive psychiatrist.

Super-standardization, having all the advantages and none of the limitations of the less accurate standardization, must be conceded to have greater value from all these standpoints. In addition it elminates fatigue, both directly and indirectly, in that it standardizes conditions and methods which induce minimum fatigue and methods which produce efficient habits and utilize the finest, most carefully taught type of automaticity. Concerning itself, as it does, primarily, with elements of motions, it facilitates the transference of skill and thus vitally affects the problem of industrial education.

Outline of address before the Taylor Society, Philadelphia, March 18, 1922.

There is imperative need today for such super-standardization, as evidenced by the need for increased production, elimination of waste and stability.

This country is suffering from unnecessary and wasteful changes, based upon nothing but a desire for novelty and embodying no element of permanence. This does not necessarily mean that there should be no change or less change—it may mean more change. It does mean that changes must be definite, progressive and stabilizing and must pay in money or in durable satisfaction.

On the other hand, Europe has made the most astonishing progress during the last few years. For example, in 1917 the Verein Deutscher Ingenieure, at the suggestion of the German government, organized a central national body, called the "Normenausschuss der Deutschen Industrie." Its members are engineering societies, manufacturing concerns, industrial associations and various departments of the government.

The organization, whose purpose is to foster standardization and to promulgate standards, has attacked many fields and published much material, ranging from standardization of lines and letters in the draughting room, to standardization of window frames for small houses.

Holland has been equally progressive, and the work of the Hoofdcommissie voor de Normalisatie in Nederland is both extensive and intensive. Nothing but a painstaking study of standards issued by these countries can make plain their overwhelming importance. This lies not so much in what they contain, as in what they imply.

OUR HOPE LIES IN SUPER-STANDARDIZATION

Europe realizes the necessity of standardization as this country does not. Moreover careful investigators confirm our findings that Teutonic Europe will, partly because of temperament, go into this matter more fundamentally than we of the Anglo-Saxon race will be apt to do, if governed only by temperament. An unceasing and costly passion for expediency has already proved a menace to the development of scientific management. Our one hope lies in super-standardization, in reducing all possible practice to standards based on accurate measurement. Here we can be supreme, for we have both the knowledge and the equipment to do the work easily, quickly and inexpensively.

An immediate effort of super-standardization will be the simplification of the problems of maintenance. These have to do with the relation between the engineer and the production manager and the stability of the work begun by the engineer after he leaves the plant and the production manager takes over the entire responsibility. The super-standard adequately applied builds up a super-standardized practice that insures maintenance of that which is best until superseded by proved, better super-standard practice.

An important means toward arousing interest and co-operation in super-standardization consists of definite examples of its application which induce the plant, the industry, or the entire country to think in terms of standards.

In the first cost super-standardization competes successfully with inaccurate methods. In ultimate cost it need fear no possible competition. It is the one best way for obtaining lower production costs and higher wages simultaneously and an immediate way to reduce the cost of living.

Methods of Machine Tool Design

Second Part of the Fourth Section—Belting Applications with Particular Reference to Countershafts, Belt-shifting Apparatus and Tightners

By A. L. DeLeeuw

THERE are cases where it is desirable to use a belt as part of the mechanism of a machine, either because some part must run at a very high speed, or because a geared transmission might cause vibrations. An instance of the first kind is the internal grinder, and one of the second kind is the drive for the work spindle of a cylindrical grinder. Though in this latter case there are machines in existence which have a very satisfactory geared drive, many people prefer the belted drive because it does not require the great care and fine workmanship, and, as a result, is less liable to cause trouble. In cases like the above, endless belts are required because any kind of belt fastener would cause shock when passing over the pulleys. The designer should make some provision for take up and for removal of belt.

There are many ways of joining the two ends of a belt, besides the method of cementing them together, but these various methods have no relation to the design of the machine, so that we do not need to discuss them here. This much should be mentioned, however, that a lumpy joint should never be tolerated.

The endless belt finds a good application in the belted motor drive of which Fig. 38 is a diagrammatic drawing. The motor is fastened to a hinged plate. The hinge is so located that the combined weight of motor and plate produces the desired tension in the belt. An adjustable screw limits the possible movement of the plate. As the illustration shows, the weight causes tension in the belt and pressure against the hinge. The diagram of these forces should be analyzed if one

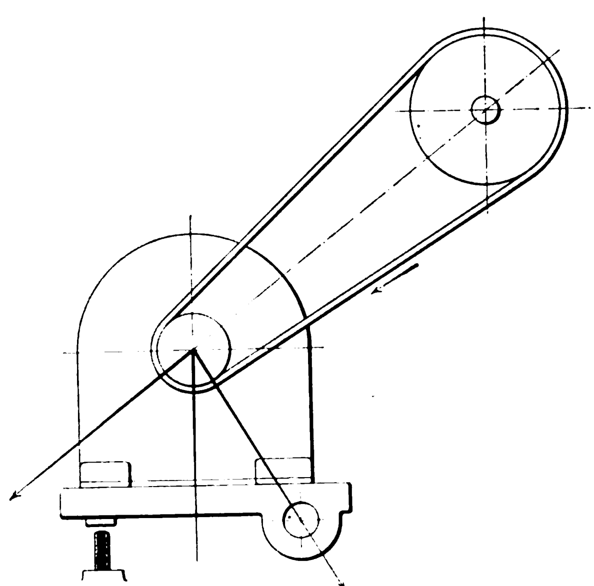


FIG. 38. GOOD APPLICATION OF ENDLESS BELT

wishes to obtain the proper tension. When the belt stretches, the limiting screw is lowered. In this manner a belt may be used during its entire life without any change whatsoever, and with absolute assurance that the proper tension will be maintained.

Idlers are used for four different purposes: To guide the belt in the desired direction; to take up slack; to give the belt the desired amount of tension; and to increase the arc of contact between belt and pulley. In this last capacity the idler has an important bearing on the success of some belt drives. The net tension in the belt—that is, the difference between the tension on the pulley and slack sides—depends, among other things, on the expression $\frac{e^{f\theta}-1}{e^{f\theta}}$ in which e is the base of the natural logarithm system, f is the coefficient of friction, and θ is the arc of contact, expressed in radians. If we compare arcs of 120 and 240 deg. and assume the

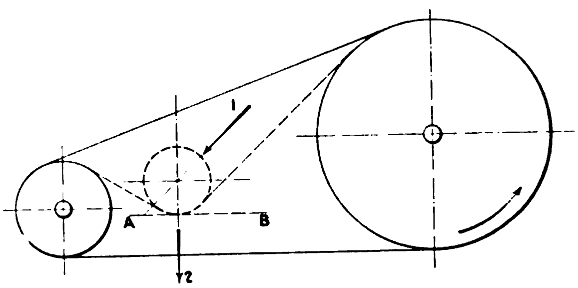


FIG. 39. DIAGRAM TO SHOW SHIFTING OF BELT TIGHTENER

coefficient of friction to be 0.45, we will find the value of $\frac{e^{f\theta}-1}{e^{f\theta}}$ to be

0.6 for 120° and
0.84 for 240°

This indicates the importance of a large arc of contact.

In Fig. 39 is shown the application of the idler pulley for this purpose. It should be located close to that pulley where normally a small arc of contact would be. In order to make the arc as great as possible, the idler should approach the pulling belt as closely as possible. When conditions permit, this idler should also be utilized for the take up. As the distance between the line AB and the pulling side of the belt is necessarily small, it might seem that the movement of the idler for the purpose of belt take up must be limited. However, by moving the idler in the direction of arrow No. 1 rather than in the direction of arrow No. 2, it will be found possible to obtain all the take up required.

It is important that the idler press on the slack side of the belt only enough to insure the proper wrapping of the belt around the pulley and the proper initial tension. Additional pressure causes more pressure on the bearings, without compensating features. For that reason weights are used, whenever possible, to insure the correct amount of pressure. Springs are also used, but are not to be recommended, as a spring exerts a variable amount of pressure for various positions of the idler.

Tight and loose pulleys form, perhaps, the most simple means for starting and stopping a machine. Nevertheless, the tendency is toward friction clutches, although these latter have been the source of a good

deal of trouble and are necessarily more complicated and, therefore, more apt to get out of order than tight and loose pulleys. The reason for this preference lies in the fact that it is extremely important to be able to stop the machine with the least possible delay and a single jerk at the shipper lever will accomplish this with a friction clutch; whereas the shifting of a wide belt from one pulley to another takes an appreciable amount of time, however quick the operator may be. The various constructions for tight and loose pulleys

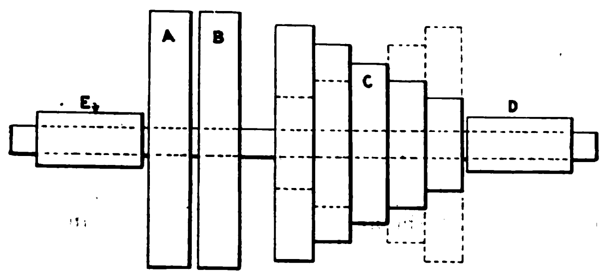


FIG. 40. ELEMENTS OF A SIMPLE COUNTERSHAFT

will not be given here as they may be found in almost any book on machine design.

Countershafts may be arranged for one or more speeds as well as for one or two directions. As a rule very little thought is given to the requirements of a good countershaft, though a great many troubles and delays may be traced to this element of the machine. In late years the countershaft has become of less and less importance, due to the introduction of the single pulley drives which permit of direct drive from the line shaft, from a motor or from a simple jack shaft. Nevertheless, there remains a large percentage of machines still driven from a countershaft, and there will probably be such a class for all time.

Simple Countershafts

A simple countershaft, one speed and one direction only, is shown in Fig. 40. The following points should be considered by the designer, and apart from the design of the various elements which, as has been stated repeatedly, will not be taken up here.

(1) Which shall be the tight pulley, *A* or *B*?

(2) Should the cone be placed as shown in full or dotted lines?

(3) What is the proper diameter and face of the tight pulley, supposing the size of the cone is given?

We can only point out here how to arrive at an answer to the first two questions. A direct answer can be given to the third question: The product of diameter and belt width for the driving pulley should be from 15 to 25 per cent more than the corresponding product for the large step of the cone.

As to the first and second questions, the following points should be considered and balanced against each other and the designer will often have to do something wrong, because doing it right might compel him to commit a greater sin elsewhere.

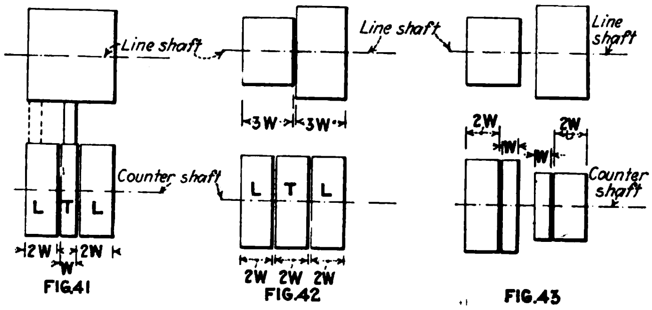
(1) The shaft should be as short as possible to avoid excessive deflection, due to weight of parts and belt pull.

(2) For the same reason the diameter of the shaft should be as large as practical. In a *large percentage of cases*, shafts are made *too small.*

(3) To minimize tension, the tight pulley should be close to the cone (or its equivalent).

(4) To minimize bending, the tight pulley should be as close to the bearing as possible.

Note: Requirements 3 and 4 clash and it is up to



FIGS. 41 TO 43. ARRANGEMENTS OF LINE AND COUNTERSHAFT PULLEYS

the designer to determine in each individual case which requirement is the more important.

(5) To minimize bending, that step of the cone which is called upon to do the heaviest work should be close to the bearing.

(6) The pulleys should be so placed on the countershaft as to bring the shipper lever within easy reach of the operator.

(7) The shipper lever should be so located in relation to the operator that the operation of stopping the machine requires a movement of the hand *toward* the body.

It will be seen that, as a rule, it will not be possible to meet all of the requirements and that a choice must be made.

Arrangements of Pulleys

A countershaft may have more than one set of pulleys, either for the purpose of obtaining more than one speed or for reversal. In many cases a difference of speed is combined with a reversal of direction, as, for instance, in lathes. When there is merely a reversal without change of speed, there is no need for different sizes of pulleys. An arrangement such as shown in Fig. 41 can be used. Here we have *one* tight and *two* loose pulleys, the tight pulley having a width sufficient for the belt used, and the loose pulleys having a face about twice as wide. The dimension *W* in Fig. 41 and subsequent sketches is supposed to be the width of the belt, no allowance being made in the sketch for clearance.

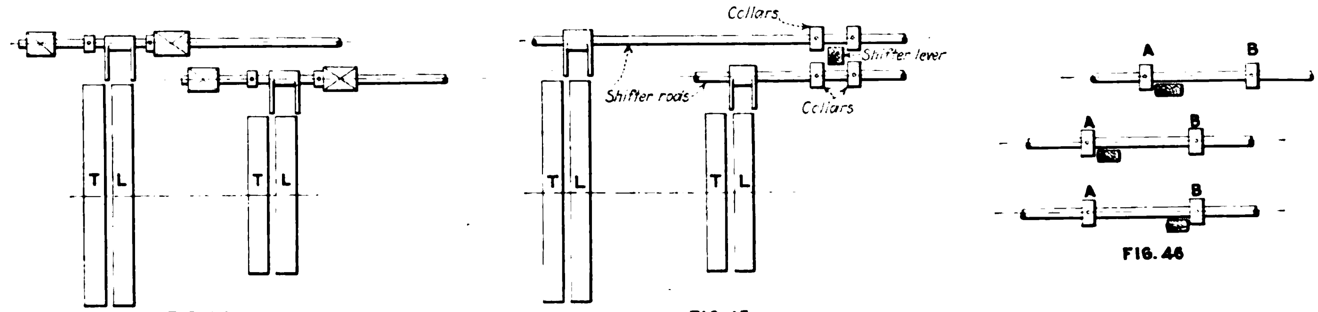
A single shipper lever, with one shifter rod and two sets of shifter fingers can be used. As will be noticed, the operator's movement for stopping the machine is sometimes correct and sometimes wrong.

In Fig. 42 we have the same conditions except that the line shaft pulleys are of different diameter, though the countershaft pulleys are of even size. Here again it is possible to do the shifting with one shipper lever. The total width of the pulleys on the shaft is here 6 *W* plus clearance, whereas in the previous case it was 5 *W* plus clearance.

In Fig. 43 countershaft as well as line shaft pulleys are of different sizes, so that there is no longer any benefit in placing them close together. They can be put anywhere on the countershaft. Here again a single lever will do the shifting. The total room required on the shaft is 6 *W* plus clearance.

In Fig. 44 the idea is dropped of shifting both belts by means of two sets of fingers fastened to one rod, and, as a result, we need only 4 *W* plus clearance on

the shaft. Furthermore, we are no longer compelled to place the loose pulleys on opposite sides of the tight pulley, but can place them as may be most desirable. We can so place them, for instance, that we obtain the correct movement for stopping the machine.



FIGS. 44 TO 46. ARRANGEMENTS OF SHAFTS, PULLEYS AND SHIFTER RODS

It is very important to arrange the stopping and starting device of any machine so that the *operator makes the movements which he would make if he were in personal danger.* A man is liable to lose his head when trouble suddenly appears and drop the habits of a lifetime to follow his animal instincts. Recognizing this in the design of machine may save the machine from being wrecked or some man from being injured or killed.

To do the shifting by means of two shipper levers is not desirable; it leads to confusion and both belts might be thrown on at the same time. To avoid this a construction is used resembling, at least in principle, the gear shift lever of an automobile. There are two shifter rods, each with its own set of belt fingers. Each of these rods has a set of collars between which one may bring the shipper lever, which is hung from a ball or universal joint. Fig. 45 shows this arrangement in diagrammatic form, and Fig. 47 shows the manner in which some of the details are worked out.

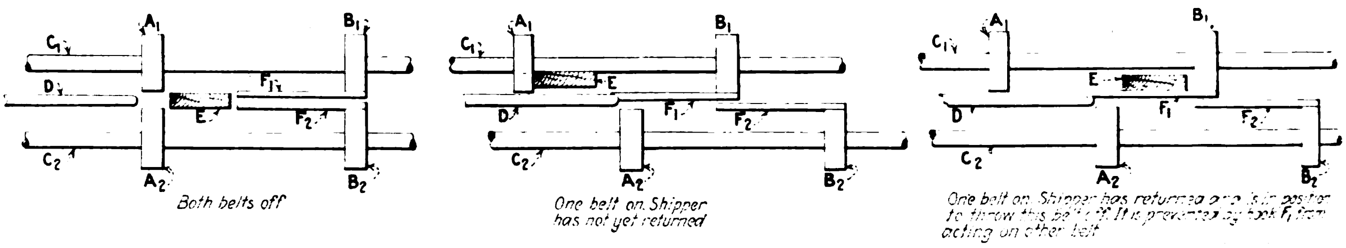
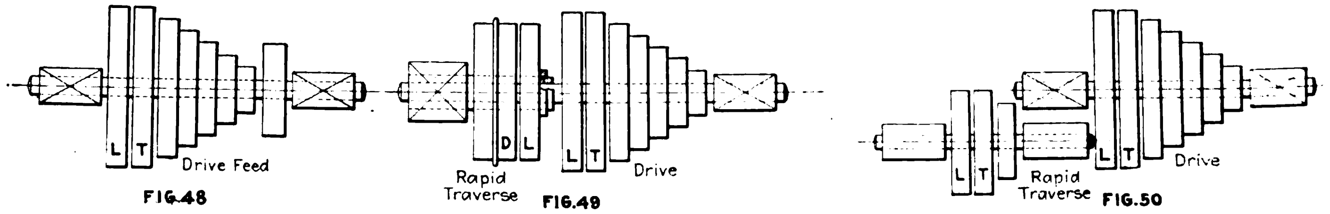


FIG. 47. DETAILS OF SHIPPER ACTION

Unless a shipper lever is locked it has a tendency to fall back to its normal position (vertical), and this means that the belt will be thrown off or on when this is not wanted. A common way of overcoming this difficulty is illustrated in Fig. 46. It consists of providing the shifter rod, that is the rod which carries the belt shifting fingers, with collars or pins which are to be engaged by the shipper lever. The collars or pins are so placed that one of them is against the shipper when the belt is on, and the other when the belt is off. If A and B are the two collars, and the shipper moves in the direction from B to A, in order to put the belt on the tight pulley, then collar A is against the shipper when the belt is off, thus giving the shipper the chance to work against A without any lost motion. When the belt is on and the shipper is released, it falls back and against collar B, thus making it possible to throw the belt off, again without lost motion.

Some such arrangement is even more necessary when two belts must be manipulated. Not only is there danger that the shipper may fall back, but the operator might easily make the mistake of pushing it forward again and throw the wrong belt on. To avoid this the collars A_1B_1 and A_2B_2 are spaced as in Fig. 47. The shipper E is hung from a ball joint and can engage either of these sets of collars by being moved sideways. A forward movement will then move rod C_1 or C_2 and throw one of the belts on. While on this forward movement the shipper is guided by guide D. When the shipper is released it will fall back and be in position to operate against collar B_1 or B_2. It also falls sideways into its original position and as the collars are positioned as shown in Fig. 46, there is nothing to prevent the operator from making a false move and pushing the other belt onto its tight pulley. To avoid this, collars B_1 and B_2 are provided with projections or hooks, so arranged that the hook of B_2 shuts off the pathway of the shipper for B_1 and vice versa. These hooks are in different planes and both are in a plane different



FIGS. 48 TO 50. COUNTERSHAFTS FOR COMBINATION OF DRIVES

from that of guide D, so that there can be no interference. Similar arrangements might be made for more than two speeds.

It often happens that the countershaft must furnish power for some other function of the machine besides the drive, such as feed or quick traverse or oil pump, or it may be that there is more than one drive to the machine, such as for duplex machines or special machines with a number of independent spindles. Sometimes these various drives bear such a relation to each other that all of them should be started and stopped simultaneously, and sometimes the opposite is required—that is, that one drive should be independent of the other. Fig. 48 shows a countershaft arranged for the drive and the feed of a machine.

Though such an arrangement is not desirable, generally speaking, there are cases where some special machine can be materially simplified by driving the feed from the countershaft. It is very important to stop the feed at the same time as the drive, for if the feed should continue after the drive has stopped tools would be broken or the machine wrecked. Fig. 49, on the other hand, shows a combination to be used when it is desirable to start the two functions of the countershaft separately. In this case the secondary drive is for a quick traverse motion of the machine or for an oil pump or for any other function which we may desire to continue after the drive has been disconnected. It would be possible, of course, to build an entirely independent countershaft, and this is often done. This scheme has certain disadvantages.

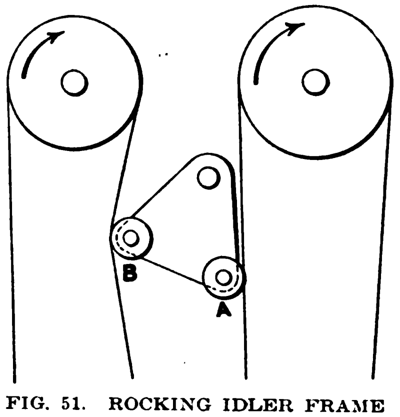


FIG. 51. ROCKING IDLER FRAME

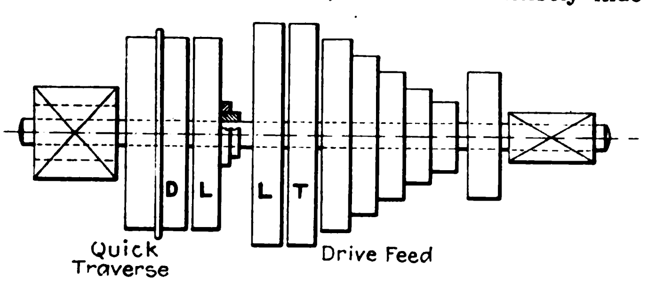


FIG. 52. COUNTERSHAFT WITH THREE DRIVES

In Fig. 50 is shown how it becomes necessary to place the quick traverse drive further away from the main drive so as to allow the belt coming from the line shaft to clear the hanger of the main countershaft, and this, in its turn, means that the machine itself is to occupy more space than necessary. The arrangement of Fig. 49 is this:

A sleeve is attached to the hanger or box of the countershaft and on this sleeve two loose pulleys are mounted. One of these is a single pulley and acts as the loose pulley for this system. The other pulley, also running loose on the sleeve, is divided in two parts by a flange, one part receiving the belt from the lineshaft and the other delivering the driving belt to the machine. Sometimes these pulleys run directly on the countershaft, but this is not advisable on account of the difficulty of properly lubricating the pulleys. The part *D* or the pulley may drive more than one machine pulley, such, for instance, as one for the quick traverse and one for an oil pump.

The chief objection to driving the feed by means of a separate belt from the countershaft is the fear that the driving belt may break or fly off. The arrangement shown in Fig. 51 is sometimes used to overcome this objection at least partially. It consists of two idlers hung in a rocking frame. A weight or spring, not shown in the drawing, forces pulley *A* against the tight side of the main belt. Pulley *B* bears against the slack side of the feed belt. This belt becomes slack and fails to drive the feed if the main belt breaks. As will be seen, this is only a partial remedy, for the feed belt would continue to function if the main belt should slip. Fig. 52 shows a countershaft with main drive, drive for feed and independently operated drive for quick traverse.

It is advisable to keep the countershaft as simple as possible. Should conditions compel the use of a complicated countershaft, this piece of apparatus should be constructed self-contained and with as much care and forethought as any other part of the machine—something which, as a rule, is not done.

Be Fair in Your Criticism

By F. H. Sweet

Effective supervision demands on the part of the executive a thorough and complete knowledge of methods and results. Too often a subordinate is allowed to proceed without supervision until he has finished his task, or until he has accumulated considerable results. You find these results not to your liking, and you censure him for not having requested supervision, when you yourself are at fault for not having furnished it in the first place. I do not mean to say that you cannot often judge by the results you are getting. In fact, it becomes necessary sometimes to limit supervision to a judgment of results.

It should be emphasized, however, that when you choose to supervise in this way, you yourself take the risk. Your criticism of the result, if adverse, must be made in a spirit of suggestion, to be used solely as a guide for future procedure and not as a criticism that might cause disappointment and discouragement, for you are responsible for the manner in which you elected to apply your supervision.

What Is Management?

By Robert Grimshaw

Management has been somewhat inaccurately defined by some bright individual as "earning one's living by the sweat of another's brow." In some sense it is correct, in that the manager, or contractor, or *entrepreneur*, as the term now goes, does at least *get* a living by others'—not one other's—exertions. If he is a good manager, he cannot merely get a living but earn it, by increasing the output and efficiency of the workers confided to his direction, and while decreasing the unit product cost, increase the workers' daily earnings, without unduly fatiguing them.

Steering Knuckles for the Mack Truck

Milling, Drilling and Boring Operations on a Heavy Forged Steering Knuckle—Fixtures Used Are of More Than Usual Interest

By FRED H. COLVIN
Editor, *American Machinist*

THE steering knuckles of any motor-driven vehicle receive severe punishment and not only must the material be strong and tough, but it must also be carefully machined. The fixtures and operations used in finishing the steering knuckles for the Mack trucks at the Allentown, Pa., plant of the International Motor Company, are of more than usual interest, the main operations being illustrated herewith.

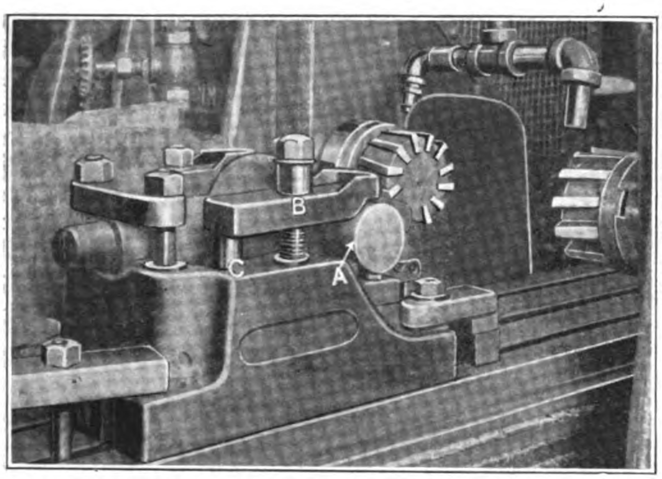


FIG. 1. MILLING THE ENDS

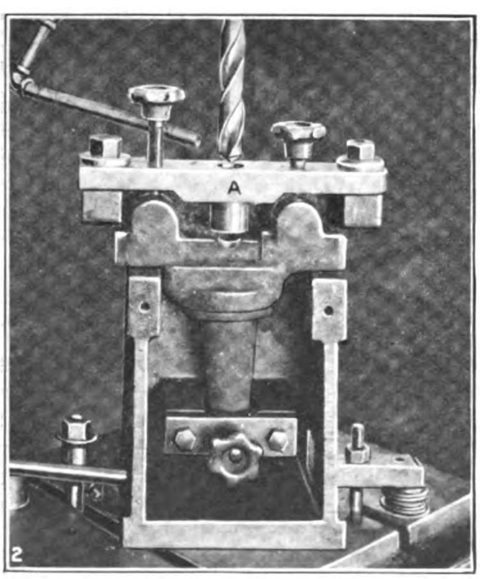
After heat-treating, the ends of the forgings are milled to length and squared for the boring of the spindle hole. This is done in the Cincinnati duplex milling machine, shown in Fig. 1. The fixture is a substantial block fitted with locating pins *A*, while the axle end of the knuckle rests in suitable V's. The clamp *B* is slotted on the under side, this slot guiding it on the upper end of the stud *C*, which serves both as a guide and a support for the outer end of the clamp.

A clearance hole is then drilled in the center of the knuckle, as shown in Fig. 2. This hole gives a clearance space for the rough-drilling which is done from each end, and also gives a starting point for the ball end milling cutter which roughs out the space for the axle. The fixture is comparatively simple, the spindle end of the knuckle rests in a V at each side, while the plate *A*, which carries the guide bushing, swings over the knuckle and holds it in place by the two screws shown.

The ends are then centered and rough-drilled into the clearance hole, a $1\frac{3}{8}$-in. drill being used for this preliminary operation, which is shown at the right of Fig. 3. The next drilling enlarges this hole, the knuckle being held in the fixture shown at the left in Fig. 3. Here the knuckle is again drilled from each end, the fixture being turned by the handle *A*, and indexed by the pins *B*.

The knuckles next go to a knee-type milling machine equipped with a special fixture and a ball cutter, as shown in Fig. 4. Starting with the clearance hole previously drilled, this cutter mills away the central portion, after which the knuckle goes to the horizontal boring machine shown in Fig. 5. Here the central portion is cut away as at *A* by sweep cutters inserted through the bar *B*, after it has been passed through the hole in the knuckle. The holes are also reamed in this operation, the reamer *C* passing clear through both sides and correcting any error in alignment which may have existed up to this point. The opening left by this operation receives the end of the axle and gives it sufficient clearance for turning.

The turning of the stub or axle end is done in the Gisholt lathe shown in Fig. 6. The knuckle is clamped at the ends as at *A*, and steadied against side movement by screws *B* on each side. The axle or stub is



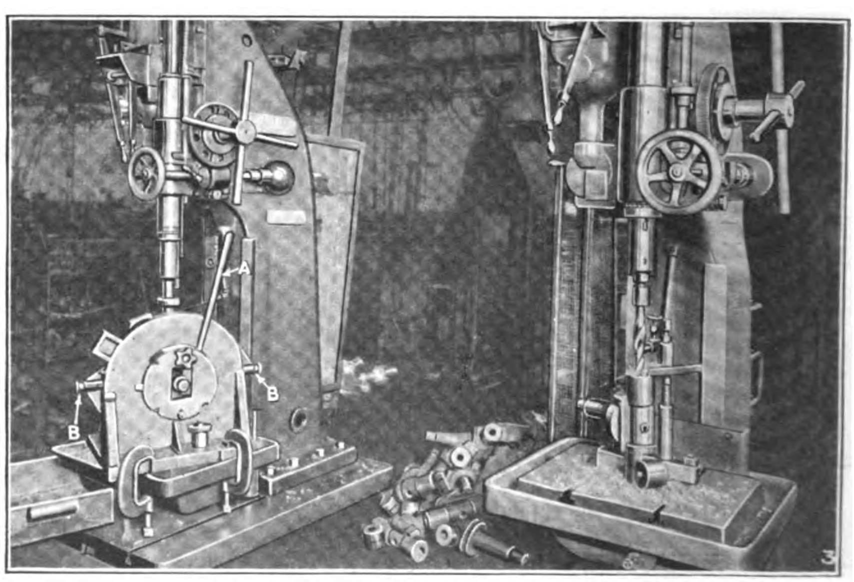


FIG. 2. DRILLING A CENTRAL CLEARANCE HOLE. FIG. 3. TWO OF THE DRILLING OPERATIONS

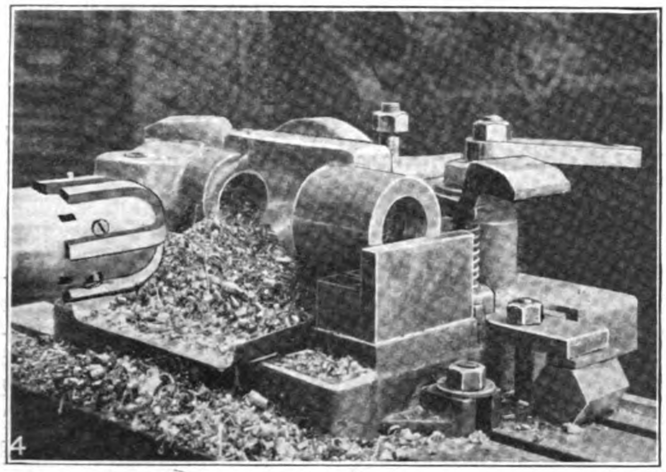


FIG. 4. MILLING THE CENTRAL OPENING.

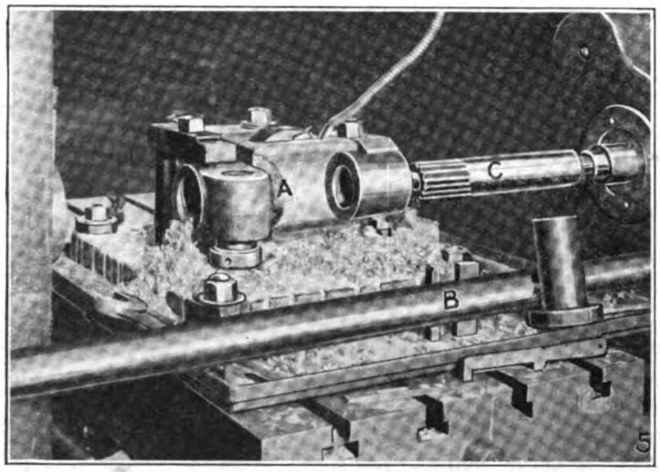


FIG. 5. COUNTERBORING AND LINE REAMING

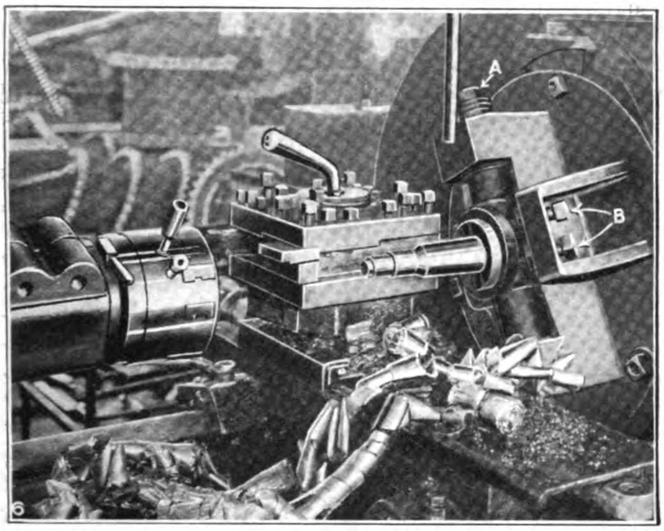


FIG. 6. TURNING THE AXLE END.

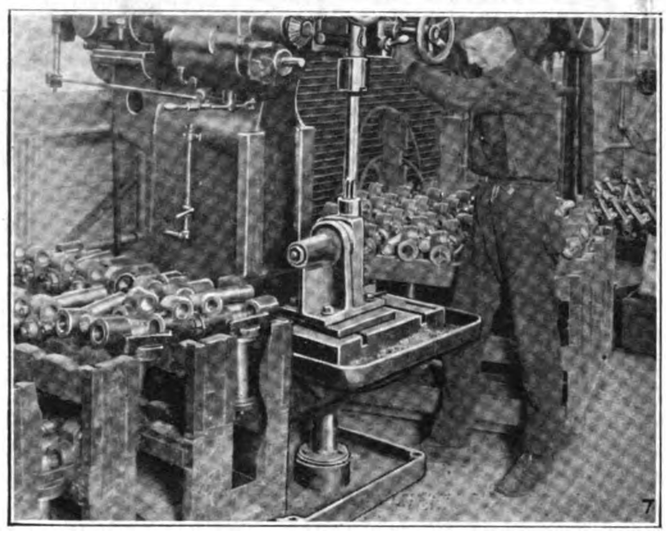


FIG. 7. THE FINAL REAMING

then turned and formed by tools in the square turret, after which the end is threaded with a geometric die head for the retaining nut.

The final reaming is done with the knuckle held in the special fixture shown in Fig. 7 under a Colburn heavy-duty machine. This view also shows the type of carrying tray used for handling the work so as to be easily accessible and at the same time protecting it against damage.

Simple Method of Marking Patterns and Keeping Records

By P. H. White

There are many excellent methods of marking patterns on engineering drawings, and any system that is well established and giving satisfaction should not be cast aside except for very good reasons. Among the different systems that have come under my observation, none is more simple than the one described below.

Each drawing is given a number, according to whatever numbering system is used. If the complete drawing requires more than one sheet, each sheet bears the same drawing number, but a different sheet number. Thus if drawing 476 consisted of four sheets, the designation would be "476, 4 sheets—sheet 1," "476, 4 sheets—sheet 2," etc. The details are all numbered consecutively, and these numbers are shown in the material list as well as under each detail part.

Every detail requiring a pattern is so indicated on the detail drawing by calling for a pattern number. The pattern number is designated by giving both the drawing number and the detail number. For example, if detail number three on drawing 476 required a pattern, the pattern number would be 476-3.

This method eliminates the necessity of keeping a separate book for pattern numbers, and enables any workman to call for the correct drawing, simply by reading the pattern number which appears on the casting. It might truthfully be called "An automatic pattern numbering system."

For keeping a record of patterns when completed, an index card is used, bearing the number of the pattern in the upper left-hand corner, and the name of the pattern just below. Next follows a brief description of the pattern, such as wood, wood master, metal, gated, plate, etc.; and in case of gated or plate patterns, the number of patterns per gate or plate. Another line indicates the number and kind of core boxes. At the bottom of the card is indicated where the pattern was made, the date and cost.

On the reverse side of the card is indicated the date and the place to which the pattern is to be transferred. When the pattern is returned from the foundry, the date of its return, and its location in the pattern vault are designated. These cards are filed consecutively, so that it is an easy matter to locate any pattern and read its complete life history in a very short time.

Factory Storekeeping and Material Control

The Fourth Article—Duties of the Purchasing Department—Speculative and Routine Buying—Distribution of Order Copies—Follow-Up Procedure

BY HENRY H. FARQUHAR

IN PREVIOUS discussions I have indicated why I felt that the regulation of material was logically and necessarily the job of the production department. There is no more important function in material work, however, than that performed by the purchasing department, since irregularities here will emasculate an otherwise perfect stores routine. In modern business it is no longer the exceptional and spectacular transaction that makes one plant stand out above another. It is largely the penny saved here and there that makes up the dividends. Such savings may be accomplished only through a well-rounded and balanced organization. Since material routine leads into purchasing at so many points, it is essential to take the view that material control includes all officials who are in any way responsible for or deal with this part of the business. From this viewpoint, therefore, purchasing forms a most important link in this chain. It does not, however, follow that the purchasing agent must in all cases report to production from an administrative standpoint (see Organization Chart of Material Personnel on page 735 of *American Machinist*).

> WITH A CLEAR definition of duties controlled through a logical and simple routine, the purchasing agent may devote more attention to the important purchasing features and may become a specialist in his own line.
>
> Speculative buying may be justified by traffic conditions, supply and demand, probable price movement, sales tendencies, labor market, storage considerations or the company's financial state.
>
> The purchase order should leave no doubt in the mind of the vendor, as to exactly what and how much is wanted, when shipment is desired and how it is to be made, and the terms of purchase.

The purchasing office has a chance to affect profits at every turn, and at many times the difference between dividends and bankruptcy may rest upon the transactions of this department. The instance shown in Table I illustrates the directness of this effect, where by a decrease of 6.37 per cent in the cost of the raw materials themselves an increase of 9.7 per cent in the *net profit* was obtained.

It is not with technical purchasing, however, that this article deals. This part of the work of the purchasing office is conducted extremely well in the average plant, for the modern purchasing agent has been trained to the specific duty of securing suitable material at the best price, and various works upon the subject may be found in any library. I feel, however, that the more routine part of his work has not been sufficiently emphasized, particularly as it affects the degree of control which may be exercised over functions other than buying proper.

I have found, moreover, so many purchasing agents who could really be lifted out of the rut into which they had fallen, through standardizing the many little irregularities that distract so much attention from the work which constitutes their main interest. The importance of the many points of contact between the purchasing office and the rest of the organization dealing with materials, and some of the means by which this contact may be made more effective in practice, I trust will be clear from the following discussion.

After the engineering department has made up lists and specifications of materials to be kept on hand, after the traffic and purchasing departments have in conjunctions furnished the time necessary to renew, to which has been added other allowances for clerical work and for necessary delays, and after the balance sheet has been put in operation through a passage for entry of all necessary papers, the replenishment order for originating from the balance sheet, or otherwise, sets the purchasing machinery in operation. It is not strictly the purchasing agent's province to originate requests for material, although it is his duty to notify the production department or the specific man responsible for material control routine, as to any probable changes in the market or other factors which in his judgment make purchase desirable. In the case of speculative purchasing he may originate the replenishment orders. In general, however, his duties start with the receipt of the replenishment order, and on

TABLE I—EFFECT OF COST OF RAW MATERIALS ON PROFITS

	Original Per Piece	New Per Piece
Material	$0.63	$0.59 Decrease of 6.37%
Labor	0.10	0.10
Overhead	0.05	0.05
Total cost	$0.78	$0.74
Selling price	1.40	1.40
Profit	$0.62	$0.66
% of cost	79.5%	89.2% Increase of 9.7%

this authority all of his future actions are based. It therefore follows without argument that no oral requests for replenishment must be acted upon by the purchasing agent unless they be immediately followed with a written confirmation on the proper form properly approved. A relaxation in this respect will very soon put the purchasing agent on the defensive if he has not the replenishment order to fall back upon.

The discussion up to this point, applies equally to speculative and to routine purchasing. Upon the receipt of the replenishment order, however, the procedure varies until the contract is closed. It is there-

For the author's forthcoming book.

fore necessary to treat this intermediate stage under these two divisions.

Whether or not both kinds of purchasing are done by one man or by different men, the only difference in the procedure between speculative and routine purchasing is that in the former case the amount of any item in the speculative class called for on the replenishment order must be looked upon simply as indicating production's actual needs for the time being and not as a hard and fast amount which must be bought. In other words, the purchasing agent is not governed so strictly by the amount called for on the replenishment order as he is in the case of routine purchasing. Depending on the state of the market and other factors, he may order either more or less, at a given time, than the replenishment order requires.

The replenishment order, however, is production's best judgment as to how much of any material should be ordered. If the purchasing agent wishes to depart from this judgment in any specific case, he may:

(1) Consult the production department or possibly the general manager, or both.

(2) Have blanket authority to increase by a definite amount or by a certain percentage the amount called for on the replenishment order.

(3) Be required to secure written approval for each transaction.

Buying More or Less Than Required Justified by Conditions

In any event, however, it must be made perfectly clear to the purchasing agent that it is not only his privilege but his duty to take up such cases as he thinks desirable, since production is not infallible in these matters. Any one of the following factors may, in the purchasing agent's opinion, justify buying more or less than the quantity called for:

(1) The traffic conditions: A freight embargo which gives the appearance of lasting any considerable period would immediately call for an adjustment upward of the amount to order. Here co-operation with the traffic department is required.

(2) The supply and demand for the particular article to be purchased: The purchasing agent should keep himself informed as to the state of production in each article and as to the probable demand for it throughout the country.

(3) The probable price movement, particularly in articles subject to stock market speculation.

(4) The sales tendencies for the product in which the article is to be used: Is the demand increasing or diminishing, and is production able to keep up with or ahead of any increase? Here co-operation with both sales and production is necessary, but such conditions must not be overlooked by the purchasing agent. Keen insight into the vagaries of the business cycle is necessary to relate purchases to price and sales trends.

(5) The labor market: Is an ample supply of labor available? Here again this is primarily production's concern, and yet the purchasing agent from his contact with traveling salesmen and others is in a position to furnish production with accurate and current information in regard to such conditions.

(6) The storage considerations: Have we sufficient room to store all that we would like, and if not, where and at what cost may adequate accommodation be secured? Will the additional cost of such storage counterbalance any probable saving due to buying in quantities far in excess of known production needs?

(7) The state of the finances of the company: Is money available for buying an excess of material, no matter how desirable, and will the loss of interest on such idle money counteract any price reduction from buying in quantity?

Since most of these matters are largely questions of judgment the only safe procedure is for the purchasing agent to receive the regular replenishment orders emanating from the balance sheets. This will back up production. In order to back himself up, the purchasing agent may secure the written approval of the general manager or some other official when the amount called for on the replenishment order is not followed.

A form for approval to change the amount requisitioned refers to the replenishment order received from the balance clerk and makes the recommendation that a different amount be purchased. Reasons for the change are given. The order is signed by the purchasing agent and space is provided for a notation of the action taken by the general manager or other official and his signature.

In times of hand to mouth buying, the replenishment order will prevent overstocking. On a rising market where long contracts may be placed it may still serve to secure deliveries in accordance with production needs. It may, therefore, serve a useful purpose at all times. As indicated previously, the purchasing agent is expected to initiate action even before the receipt of the replenishment order if, in his judgment, conditions appear to require or render advisable immediate or heavy purchase.

After a decision to purchase is made and approval secured, technical purchasing then comes into play until the terms are made and the contract closed. The procedure from then on is identical under both speculative and routine purchasing.

Routine Purchasing Most Satisfactory in Many Plants

It may be objected that such a division of work and responsibility is limiting the purchasing agent and giving him a smaller place within the organization than that to which he is rightfully entitled. This, indeed, is almost the invariable reaction when such a reorganization is proposed to an existing purchasing agent. That the reverse is actually true, however, in that the purchasing agent is given a much better opportunity to measure up to his responsibilities, would seem to be proved by the number of plants and purchasing agents which have found such an arrangement entirely satisfactory.

By such a clear definition of duties according to functional lines and abilities, assisted and controlled through a logical and simple routine, many purchasing agents have found that they could give more attention to those features of the work for which they have long desired more time. They can stand absolutely within their own ground as defined and yet have an ample chance to influence others with whom their work is connected. It is simply a further logical extension of the modern subdivision in administrative duties whereby each man may become a real specialist in his own particular line, unhampered by irrelevant or distasteful routine, or wrongly placed responsibility.

After the decision to purchase is reached, therefore,

the formal purchase order is issued. This must provide for:

(1) The serial number of the purchase order. This gives a cross index between the replenishment order and the purchase order, since when the latter is made out its number must be entered on the replenishment order and the replenishment order number entered on the purchase order. In case one replenishment order calls for several articles requiring several corresponding purchase orders, care must be taken to see that these cross reference entries be completed.
(2) The name of the company making the purchase.
(3) The date of the order.
(4) The name of the vendor from whom the purchase is to be made.
(5) The quantity and description of the goods ordered. This should be specific, so that if there is any mistake in the goods the vendor cannot lay it to a lack of definite detail.
(6) The date the delivery is wanted. This again is just as important on the purchase order for the information of the vendor as it is on the replenishment order for the guidance of the purchasing agent.
(7) The shipping and billing directions. Much trouble is caused in every receiving department because incoming packages are improperly marked. The necessity for marking all packages on the outside with the purchase order number should be emphasized in a prominent place on the face of the purchase order.
(8) The symbol or other short designation of the article ordered. This is for definiteness and to save clerical work in writing and re-writing long names.
(9) The name of the requisitioner.
(10) The department or person for whom ordered.
(11) The replenishment order number (see use under No. 1 above).
(12) The signature of the purchasing agent.

The matter listed under numbers 1, 2 and 7 as far as standard shipping and billing directions go, may, of course, be printed on the form when it is set up, as the form in Fig. 7 shows.

The purchase order must be made in varying numbers of carbon copies according to circumstances and procedure. Ordinarily as a minimum there must be the following:

(1) The original copy to be mailed to the vendor. Fig. 7 shows a form for this copy.
(2) A copy for the requisitioner.
(3) A copy for the purchasing agent's office to be filed by the serial number of the purchase order.
(4) A copy for the purchasing agent's office to serve as a follow-up tickler. Fig. 8 illustrates a form for this use.
(5) A copy for the balance and receiving men.

In addition to these, various other copies may be needed; for instance, one for each department foreman who is to work upon the material ordered, one for the auditor, and so on. Ordinarily, however, the five copies listed serve as a simple and effective basis for strict control and follow-up.

The purchasing agent's obligation should by no means cease with the dispatch of the purchasing order. Upon him falls the duty of specifying the time necessary to renew. His responsibility, therefore, commences with the receipt of the replenishment order and continues until the goods are laid down at the factory door in the time allotted. It therefore behooves him not only to allow himself plenty of margin in quoting such delivery time, but also to notify the production department immediately if for any reason he receives a replenishment order calling for delivery at a date which he knows cannot be lived up to. His acceptance of this date throws upon him the responsibility of having the goods on hand at the time set provided the request is made within the allowable time.

In order that all data in regard to each transaction be readily available, and that adequate supervision of outstanding orders be possible, it is necessary first that an automatic follow-up of each order be secured, second, that complete information covering the articles ordered themselves and the amounts of various articles outstanding with any vendor be obtainable, and third, that adequate files of catalogs, specifications, quotations and similar material be readily available.

The uses of the copies of the purchase order enumerated above by which this follow-up of each order is obtained are as follows:

(1) The original goes to the vendor and should leave no doubt in his mind as to exactly what and how much is wanted, when the shipment is desired and how it is to be made, and terms of purchase. The form in Fig. 7 provides for these details.

The Requisitioner's Duty

(2) When the requisitioner's copy reaches him, it is the requisitioner's duty to check its accuracy and to report back immediately to the purchasing agent if it is not satisfactory in every way. His failure to do so throws back upon him the responsibility for mistakes in the order itself, since the purchasing agent becomes relieved of this responsibility by forwarding a duplicate copy of a correct transcription of the replenishment order.

(3) The purchasing agent's copy should be made out on paper suitable for permanent filing by the purchasing order number in a loose-leaf binder, where each new order should be filed by serial number when issued. On this copy may be entered all notations of the action taken in the case, so that a summary of all transactions may be instantly available. If the terms of purchase are modified after the original order has been mailed, if a new delivery date has been agreed upon, or in fact if anything has occurred to modify the original agreement, notation to this effect should be made on this copy. Progress of fulfillment of the contract should appear here, and when it has been completed this copy should be so stamped. It remains as the permanent purchasing office record of the transaction, supplemented by correspondence and other matter in the letter file.

(4) The purchasing agent's tickler copy: Every purchase order sent out should have a delivery date indicated on it. This date may be of vital concern or of comparatively little moment as the case may be. Nevertheless, some date must appear. This date, moreover, must go out with the expectation that the vendor will live up to it or notify the agent to the contrary immediately upon its receipt or when he finds it impossible to do so. The burden of the follow-up, however, must rest upon the purchasing agent, since no

one will look after our business for us if we fail to do our part.

Depending upon the urgency of the order, therefore, the purchasing agent will enter a date on the tickler copy when he wishes the transaction brought to his attention. The form in Fig. 8 allows space for several of these dates. The date of delivery may be, say, August 1, and since it is imperative that the goods be received not later than that date, it is desirable to follow up the order on July 25. This date, July 25, would then be entered as the tickler date.

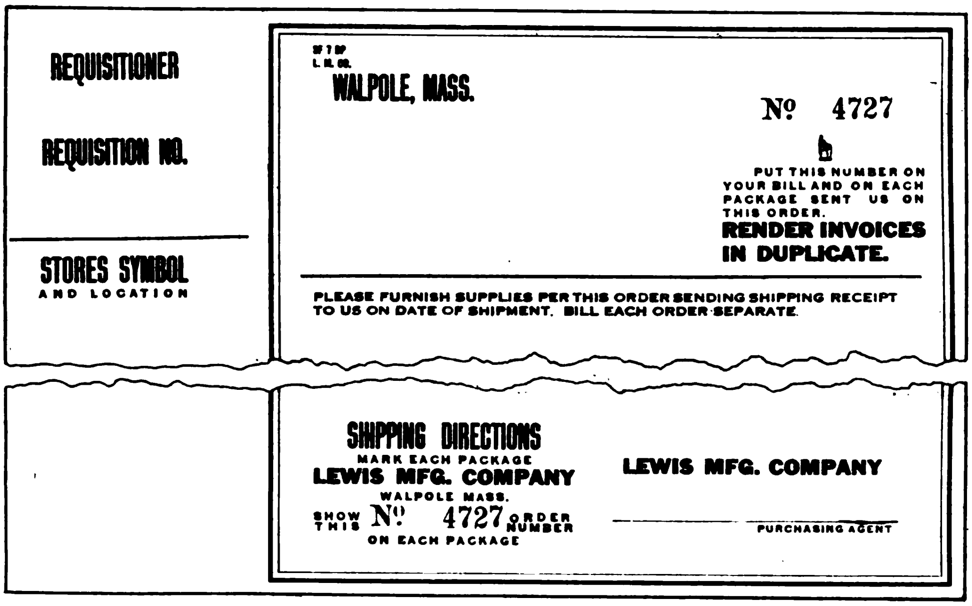


FIG. 7. A FORM FOR THE ORIGINAL PURCHASE ORDER COPY FOR THE VENDOR

The tickler copy would then be filed in a special tickler cabinet with drawers and guides for each month of the year and folders for each day of the month. When July 25 arrives, the clerk will remove all papers in that folder, which may contain not only this copy of the purchase order but also any other matters to which the purchasing agent desires his attention called on this date. The tickler copy will be laid on the purchasing agent's desk, when he will take up such follow-up measures as he deems desirable.

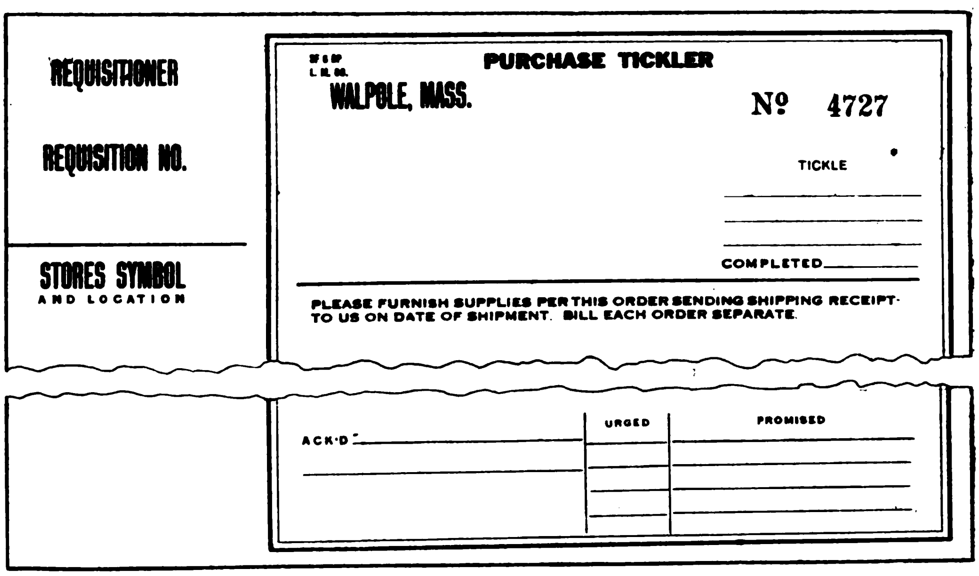


FIG. 8. A FORM FOR THE TICKLER COPY OF THE PURCHASE ORDER

A form card with an attached reply card to give the required information has been found satisfactory for this purpose, and results in a considerably higher percentage of replies than where the routine formal letter is used, requiring on the part of the vendor the repetition of information identifying the order.

When the delivery of an outstanding order is delayed, or when the purchasing agent obtains the information that it will be delayed, he must immediately notify the requisitioner to this effect. Of course, it may not be considered necessary to follow every order before shipment is due from the vendor, for to do so entails much additional work. On the other hand, some plants find it advisable to systematically follow-up all orders three or four days before they are due. Such procedure is recommended particularly during upset traffic conditions.

In any event, however, the purchasing agent is not ordinarily in a position himself, and should not be expected to differentiate between those articles for which there is urgent need and those which may come along somewhat after the date promised. If delivery is to be delayed he must immediately send a notice to that effect to the requisitioner. Then, according to the requisitioner's reply as to the urgency of delivery, he may deal with the exceptions only, letting the shipment go for a few days or bringing all possible pressure to bear for quick delivery as the particular case demands.

After the follow-up is obtained and a new delivery date is set, another follow-up date is entered on the bottom of the tickler copy and it is again filed under that date, and when shipment is complete it may be destroyed or otherwise filed as desired.

(5) The receiving clerk's copy of the purchase order may first be sent to the balance clerk for posting to the proper balance sheet, either classified or unclassified. It then goes to the receiving man who posts it temporarily for the inspector to note and then files it by the name of the vendor. A separate copy may also be made for information and retention by the balance clerk.

It is well to let the inspector look over the receiving man's copy of the purchase order as soon as it is received, particularly in the case of large orders, so that he may make arrangements for the inspection

himself, delegate this work to another, or give any necessary directions.

Before taking up the final stages in the purchasing department, that is, the routine after receipt and notification of goods received, the other records necessary to adequate purchasing regulation may be pointed out. We have described so far, and quite fully, the following records:

(1) Original replenishment order: After the resulting purchase order has been made out, this replenishment order is filed by date of requisition.

(2) Copy of the purchase order filed by serial number.

(3) Requisitioner's copy of the purchase order.

(4) Tickler copy of the purchase order.

(5) Balance and receiving clerks' copy of the purchase order.

In order to make the data of all transactions available, it is necessary further that the purchasing department have records as follows:

(6) An alphabetical letter file for correspondence with the various vendors: This file should be supplemented by a tickler file.

(7) A card index or other record by material: These records may be filed by name of material, or preferably by symbol if symbols are used. In any event, this form should show description of material, dates of various replenishment and purchase orders, from whom purchased, quotation and delivery. Such extensive data are unnecessary in the smaller plants and I have found some purchasing offices conducted satisfactorily where this record shows only the name of the article and the changes in price.

A Vendor's File Not Always Necessary

(8) A vendor's file, showing the name and address of each vendor with whom the company deals, the articles purchased, the terms and deliveries: This record may be unnecessary in smaller plants.

(9) A catalog file: Some systematic method should be adopted for filing catalogs, since in the average purchasing office constructive use is not made of them due simply to their inaccessibility. A system of numbering at least each catalog should be employed, and a card index by article should refer to every catalog where this article is described. Another card index by manufacturers should show the file number of each manufacturer's catalog.

Depending on the type of balance sheet used and the information which is summarized on it, some of the above records can be eliminated. For instance, suppose it is desired to find the names of the various vendors from whom we have ordered a certain article during the past year. Instead of requiring the purchasing agent to keep such data, we may request the balance clerk to give us from the proper balance sheet the purchase order numbers for each purchase of this article. These will enable us to turn at once to the copy of the purchase order filed by serial number. Similarly, information covering promptness of delivery may be obtained from the balance record.

No attempt is made here to specify what shall and what shall not be kept in each place, since this is a question to be determined in each case and depends on various factors. With these records, however, or with suitable combinations or substitutes, any question in regard to material, vendors, prices, or follow-up may be readily ascertained.

Prospective Machinery Markets in China

By W. C. Murphy
Treasurer, Providence Mill Supply Co.

A recent six-months' trip to the Far East has given me some first-hand information on machinery markets there which may be interesting to your readers. In what follows I have set down a few impressions as they occurred to me.

The things to consider in this proposition are: The monetary situation as relating to the rate of exchange, European competition, the mental attitude of the buyer, the matter of credit, the care used in the packing of the merchandise, and the political situation in China.

Take first the matter of exchange. At present the gold dollar is worth twice the silver dollar of China and it can readily be seen that this has a deterrent influence in the fluent purchasing of American goods by the Chinese. As the rate stood two years ago, the silver dollar being on a par with gold, the securing of orders in our line was a comparatively easy matter, and the writer secured some important business, possibly to some extent caused by the fact that the European countries had not arrived in the field.

European Competition on the Increase

At the present time, the European competition is strong and will continue to be stronger and keener. With this to contend with and with the depreciated value of the silver dollar, our recent trip was not nearly so successful as that of two years ago.

A very important thing, however, is the fact that the Chinese generally have a very friendly feeling toward the Americans and American merchandise and the attitude of the buyer indicates a strong desire to trade with us. We were told on various occasions that they liked to have us come to China and wanted to do business with us because we did not come to exploit their country or to ask for special concessions or privileges of any kind.

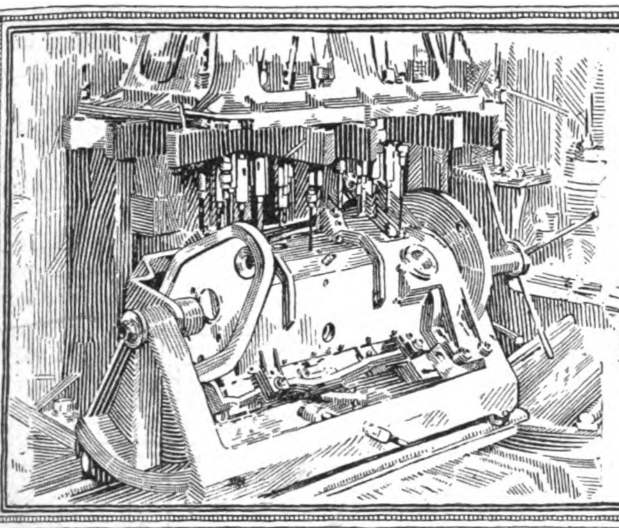
In the matter of credit, the Germans and English are very lenient, especially the Germans, and arrangements are made so that long terms and easy payment are allowed.

European Shipper Packs His Merchandise Better Than the American

Another thing in which the European shipper is ahead of us is in the packing of the merchandise. He exercises far greater care than we do in this important matter. The writer talked with the American Consul in one of the large Chinese cities and was informed by him that he was constantly taking up the matter of claims of the native merchants who had received goods in a damaged condition on account of inferior packing.

There seems to be plenty of money in the Orient and a strong desire to invest in manufacturing enterprises, particularly textiles and metals, but the greatest drawback is the instability of the government and the consequent fear of internal strife which carries with it the possibility of property destruction.

When this great and wonderful land of nearly five hundred million people gets straightened out, and a united national spirit is established, what a market there will be. With the feeling toward America that now exists among the Chinese, it would appear that the securing of a large proportion of this huge business depends largely upon ourselves.



Tool Engineering

By
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Tooling Vertical Turret Lathes and Boring Mills — Points of Importance in Design of Chucks and Faceplates — Special Fixtures for Holding Irregular Work

IN OUR previous articles we have described methods of handling work on turret and engine lathes. These machines are used for work up to 16 or 18 in. in diameter, and occasionally for pieces of even larger size. For heavy work of large diameter, and even for some kinds of work of comparatively small diameter, the vertical turret lathe and vertical boring mill are more suitable. One of the principal reasons for this fact is the difficulty experienced in chucking large and heavy work on the horizontal type of machines.

It is necessary to discuss the relative merits of vertical and horizontal types of machines for boring, turning and facing, as the field of one overlaps that of the other to some extent, so that it becomes largely a matter of the selection of a machine most suited for a given piece of work. Speaking generally, the vertical turret lathe and vertical boring mill are suited to heavy work requiring the removal of considerable stock. Machines of this type are very powerful and adapted to heavy cutting with corse feeds. The tools and fixtures for vertical boring mills bear a strong family resemblance to those used on turret lathes; they are, however, considerably heavier and capable of withstanding greater pressures.

There are several types of vertical boring machines, differing from each other in their general details of construction. One of these types is the vertical turret lathe, another the vertical boring mill, another the multiple-spindle semi-automatic chucking machine. The first of these approaches the horizontal machine most closely in its general features of construction. The application of tools is also quite similar, although there are distinct points of difference. In order that the designer may understand the general details of construction of vertical turret lathes and boring mills, a diagram of each type is shown in Fig. 387. These diagrams are not intended to reveal details of the machines, but only to show general points in construction.

The diagram at A shows a vertical turret lathe having a heavy table B in which chuck jaws are mounted. The turret C has five sides and is located on a vertical slide D. The saddle E slides horizontally along the guides F, a positive stop being provided for determining the central position of the saddle. The turret slide is so mounted that it can be swiveled to an angle of 45 deg. on either side of the center line, thus adapting it for angular work. The sidehead G is of very heavy construction, and is located on a vertical slide H. A four-sided turret toolpost K is provided with slots for holding tools.

The speeds are obtained through a transmission gear case and clutches quite similar to the type used for automobiles. A wide range of feeds is obtainable through a gear box conveniently located. The necessary changes can be made rapidly, and suitable markings enable the operator to know just what feeds he is using. The slides have power rapid traverse in order to assist in setting for various positions. Diameter readings are obtained by means of graduated slides, micrometer dials and observation stops arranged so that they can be conveniently read by the operator. The machines are capable of the heaviest kind of cutting on steel and a very high degree of accuracy can be obtained. Machines of this type are made in capacities ranging from 24 to 54 in. in diameter.

The vertical boring mill at L is similar in general construction to the vertical turret lathe just described, except that there is no sidehead or turret. In some cases a special slide on this type of machine is furnished with a five or six-sided turret, but this is not standard on all types of machines. The points of difference between the vertical turret lathe and vertical boring mill can be readily appreciated by a reference to the illustration. The table M is provided with chuck jaws and T-slots for holding fixtures when necessary. The toolslides N and O are held in saddles P and Q, which are adjustable along the horizontal guides R and S. Occasionally both heads are arranged so that they can be swiveled through an arc of about 45 deg. Standard toolholders with forged tools of suitable shape are located in a hole in the lower end of each toolslide. A positive means of clamping and locating is provided. Rapid power traverse of toolslides and saddle is given, to avoid the necessity for long and tedious hand adjust-

For the authors' forthcoming book.

ments. A wide range of speeds and feeds is obtainable through a transmission case, clutch and gear box.

These two types of machines are the only ones for which we shall consider tooling methods. The multi-spindle semi-automatic chucking machine requires special study, and as this work is somewhat specialized we do not feel justified in going into the subject in detail. In general, the principles which we have mentioned and the methods described will apply to all varieties of turning and boring machines, with modifications to suit the different types.

The method of holding work on boring mill tables is of interest, and while the chuck and jaws are similar to those used on a horizontal turret lathe, the application of fixtures to the table is somewhat different. Fig. 388 shows a perspective view of a boring mill table at *A*. This example has a three-jaw universal chuck built into the table. The jaws *B* are held down on sub-jaws *F* by means of bolts shown at *C* and *D*. The table itself is slotted in a number of places, as indicated at *K* and *L*, in order to facilitate clamping work or attaching fixtures. The center hole in the table is often used for obtaining the correct position of the fixture by using a locating plug in the hole.

The jaw arrangement is rather unusual, as each sub-jaw *F* is so constructed that its under side meshes with a scroll ring operated by a pinion. The movement of the jaws is obtained by using a socket wrench on the square head of the operating shaft *H*. Three of these shafts are located in the table so that they are easily accessible. Through the scroll ring the jaws are operated uniformly, but there is also an independent movement of each jaw obtainable by means of the screw *G*. This movement is convenient when chucking irregular work, as it allows the jaws to be set in different positions from the center, yet at the same time they can be operated with a universal movement.

The top of each jaw is grooved deeply across its face, so as to allow various settings of standard jaws. To keep the scroll ring covered and prevent chips from clogging the mechanism of the chuck, the sub-jaws are very long so that protection is assured at all times. The amount of movement of the sub-jaws is small, the top jaws being set in whatever position may be required for holding a given diameter of work. The detail illustrates the method of clamping the top jaws to the sub-jaws.

It must be remembered that the vertical turret lathe or boring mill has a table of large diameter, and it is therefore of great importance that it should be rigid and capable of withstanding a great deal of pressure during the cutting action. The sectional view through the spindle shows the table *A*, on the under side of which is a large bevel ring gear *N* driven by a pinion O. The table is attached to a spindle having a conical bearing seat *P*, which not only stabilizes the table but provides an ideal bearing surface. The hole *Q* in the center of the table is useful in locating fixtures or bushings. A filler plug *R* is placed as shown, in order to prevent chips and dirt from working down into the moving parts of the machine.

Fixtures used on vertical boring mills are for the most part simple in design, although exceptional cases may require a fixture more or less elaborate, according to the nature of the work. Such matters as the production required and the number of pieces which are machined in each lot have an effect on the design of fixtures. A great deal of work which is handled on boring mills is put through the factory in comparatively small lots, say twenty-five or fifty pieces at a time. When fixtures are required for work of this kind,

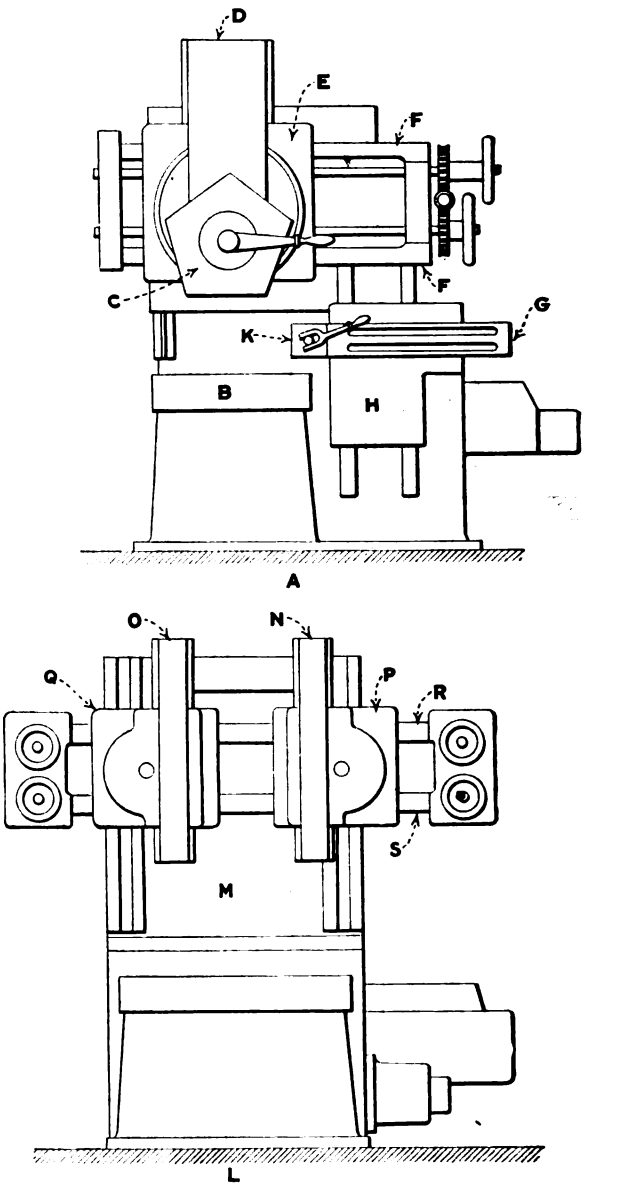


FIG. 387. DIAGRAMS OF VERTICAL TURRET LATHE AND BORING MILL

it is necessary to make them so that they will withstand rough handling and a considerable amount of wear on the various finished surfaces.

General matters connected with the design are much the same as those which have been previously mentioned on the subject of turret lathe fixtures. The only difference is in the size of the parts, which naturally require heavier fixtures and those capable of withstanding more severe usage. The following points must be considered in the design:

(1) The location of the work is of primary importance, whether it is the first setting of a piece of rough work or another setting in which the piece must be located from a previously finished surface. Points of location and surfaces on which the work rests should be made in such a way that they can either be trued up readily to preserve the accuracy or replaced by other units when worn.

(2) The rigidity and driving power of fixtures used for this kind of work is of supreme importance, as the

cuts which are taken are heavy and there must be no vibration if first-class work is to be obtained. Even when work is held in chuck jaws, the shape of the work and the amount of material which is to be removed may make it necessary to provide additional means of holding and driving, in order to withstand the excessive pressure resulting from the cut. There is an old story told of a manufacturer of vertical boring mills; when asked how many machines one man could run he replied that "It takes two men to run one machine, one man to operate the machine and the other to carry away the chips." While we must admit that this statement is somewhat exaggerated, it illustrates the

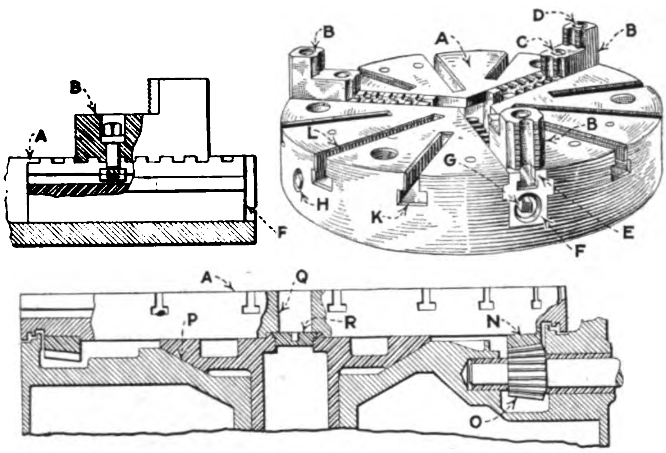


FIG. 388. BORING MILL TABLE AND CHUCK

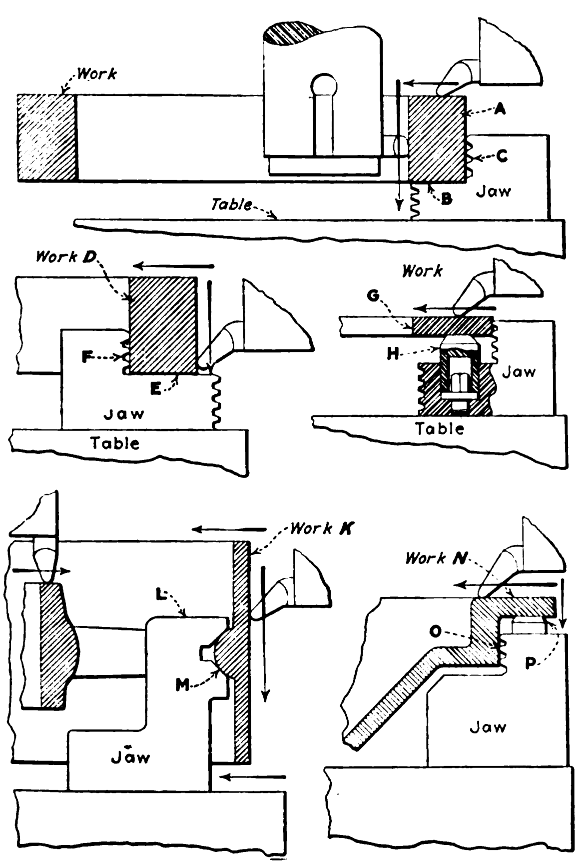


FIG. 389. METHODS OF HOLDING WORK IN CHUCK JAWS

point and indicates the tremendous power and production possibilities of these machines.

(3) Economy in the design of fixtures for vertical turret lathes should be carefully studied, as the fixtures are often so large that the cost of patterns and cast iron alone may be excessive, unless considerable thought is given to the design. Another point in this connection is that the large size of the fixtures makes them somewhat awkward to machine, and it may be better to make them in several units, rather than to use a single casting of large size which would be difficult to machine. The methods of clamping do not generally require much of a special nature, but the necessity for holding the work rigidly makes it obligatory to use clamps to which sufficient pressure can be applied.

(4) Convenience and the accessibility of various movable parts on the fixture are quite important, and should be studied with care when designing. Locating points should, if possible, be arranged so that they can be seen, even if it is necessary to core openings in the side of the fixture to allow the operator to look through and see where he is placing the work. The method of setting up a piece in the fixture should be such that it will be as convenient for the operator as possible. Certain kinds of irregular work may require a fixture having a latch which can be swung to one side when placing the work in position. When anything of this kind is necessary, the direction in which the latch swings should be such that the accidental starting of the machine will not cause the swinging member to come in contact with the sidehead or some other portion of the machine and cause breakage. The pivot should be so placed as to avoid any trouble of this sort.

(5) The removal of chips from fixtures often causes trouble, unless proper provision is made so that they can be readily swept out. A pot fixture, for example, may be excellent for holding the work; but if it is so constructed that it will soon fill up with chips, it will cause much loss of time in manufacturing. Cored openings can usually be provided so that chips will fall out by themselves. The experienced designer takes these points into consideration when making up a tool, no matter whether it is for a jig, cutter or fixture.

(6) The accuracy of the finished product may often effect the design of the fixture; hence, the tool engineer must consider this in the early stages of the design. For important surfaces which are to be machined in accurate relation to each other, the tool equipment must be designed with this point in mind. In the location of the work, also, the matter must be considered and proper methods of clamping and locating used.

Holding Work in Chuck Jaws

A great deal of the work done on the machines of the types just mentioned is held by means of standard or special chuck jaws. We have previously shown a number of applications of chuck jaws to turret lathe work, and many of the points in design mentioned there are equally important for jaws used in holding work on boring mills. One point, however, which is quite different is the fact that the work is held in a horizontal plane, so that it is only necessary to lay it down in the chuck jaws in the proper position, its own weight keeping it in place while the jaws are being tightened.

There are exceptional cases when work is of such shape that it requires a special chucking device on the turret, but these cases are rare and can usually be solved by a designer of average intelligence. Standard chuck jaws can often be used for holding work, unless it is of peculiar shape or would not permit the tool to pass over the surface to be machined if standard jaws were used.

In Fig. 389 are shown a number of examples of

standard and special chuck jaws in their application to various pieces of work. In the example *A* the work rests on the surface *B* of a standard jaw, and is held by the outside as shown at *C*. Since this piece of work is to be bored and faced, as indicated by the arrows, it is clear that these jaws can be used for holding so that nothing special will be required.

In the example *D* the work rests on a standard jaw at *E*, being gripped by the inside as shown at *F*. The work which is to be done is facing the upper surface and turning the outside diameter, as indicated by the arrows. If set up in the manner shown, the outside turning tools could not be used without running into the jaws. It is not by any means necessary, however, to provide special jaws, as raising blocks can be placed under the rim of the work, thus providing clearance between the jaw and the work so that the tools can pass by. Another method of holding a piece of work in order to allow clearance for the tool is shown at *G*. Hardened buttons *H* are placed in the bolt holes of the jaws, and the work rests on these buttons.

The work shown at *K* is a large pulley which is machined on the outside, the two rims, the hub and the hole. In order to hold the rim so that these surfaces can be finished in one setting, a special form of jaw *L* is used. This jaw is cut out in V-form, as shown at *M*, so that it grips the inside of the flange and at the same time locates it in a vertical direction. The example shown at *N* also requires the use of special chuck jaws on account of the shape of the work. The jaw is made so that it grips the piece at the point *O*, and the flange rests on a hardened stud *P* on top of the jaw.

It must be remembered that the chucks on these machines are very powerful, and that, therefore, care must be used in gripping the work so that it is not distorted and thrown out of shape by the pressure of the jaws. Special methods may be necessary for thin work, in order to prevent trouble being caused by distortion. Other points in connection with the design of chuck jaws have been fully treated in our previous articles. Cases which require special treatment can usually be handled by an application of principles which have been mentioned.

It is very necessary to make fixtures for vertical turret lathes and vertical boring mills of a substantial nature, so that they will withstand the heavy cutting action. Not only must the fixtures be made strongly, but the method of holding the work must be such that the latter will not turn or change its position when heavy cutting is necessary. Certain kinds of work are of such a nature that they cannot be readily held in chuck jaws, and when such a part is encountered a fixture must be designed expressly for it. An example of this kind is shown in Fig. 390, in which the work *A* is a large cast-iron drum which is to be machined on the top, outside diameter and the flange. On account of the shape of the work it cannot be held easily in chuck jaws, as these would need to be made very high in order to grip the piece securely. The fixture *B* is substantially made of cast iron and located on a plug *C* which fits the center hole in the boring mill table. The outside diameter of the drum is 19 in. when finished. The drum slips over the central portion of the fixture and rests on three hardened plugs *D*, spaced equidistantly under the flange.

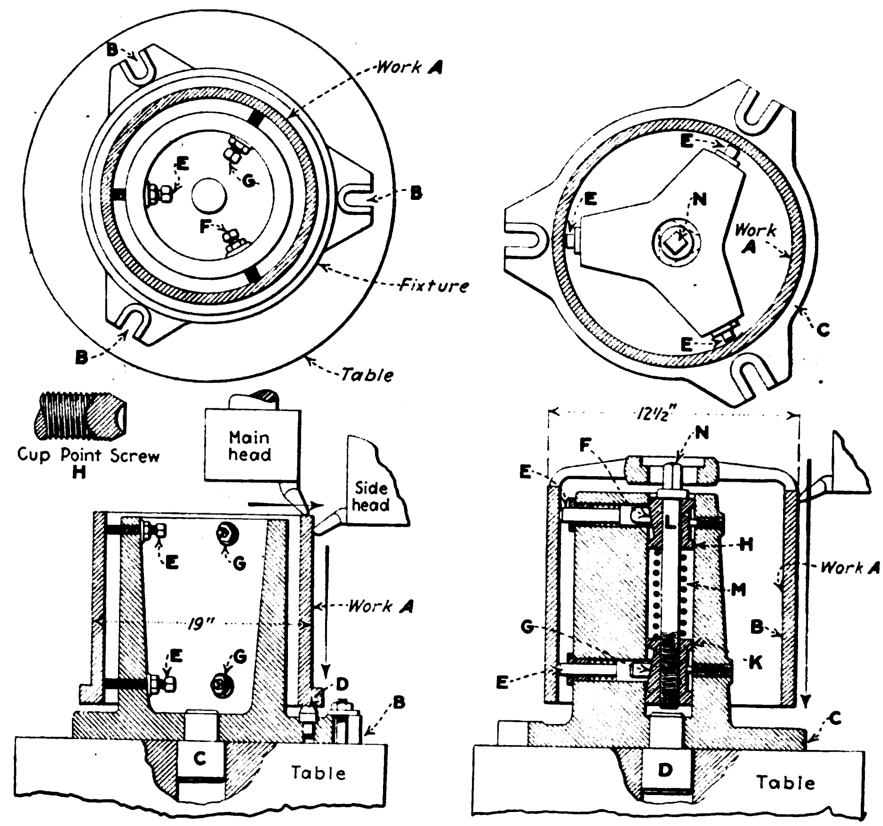


FIG. 390 (LEFT). VERTICAL TURRET LATHE FIXTURE FOR DRUM. FIG. 391 (RIGHT). PIN CHUCK FOR ELECTRICAL UNIT

A central location for the work is obtained by the use of setscrews *E* and *F* which are fixed in position. They are not disturbed when setting up the work on the fixture; but the setscrews *G* are easily accessible, and they are tightened by the operator with a wrench. It will be seen that the principle used here is similar to others which have been described in connection with fixtures for horizontal turret lathes.

A point of importance is the shape of the setscrews used. The cone-point type is unsuited to work of this kind, as it is very difficult to set up this type of screw with sufficient pressure so that it will withstand the vibrations produced by the heavy cutting action. A cup-point screw like that shown in detail at *H* will give much better results, as considerably more than a point contact is obtained from this variety. On short cuts which do not require the removal of a great deal of stock, a cone-point screw may answer the purpose, but for general use a cup point is much superior as its contact with the work is so much greater.

Fixtures used for vertical boring mills are frequently very simple. Oftentimes some of the work required in finishing the fixtures can be done on the boring mill table, which is of course an advantage, as it is then certain that the fixture will run perfectly true with the table. Patterns used for large fixtures are generally simple and they are not finished carefully in the majority of cases. In order to prevent cracks and

ruptures of the castings, all fillets should be made large.

Many cases are found in which it is necessary to hold a piece of work by an inside cored surface, in order that the piece may be finished true and concentric with the inside. The last example showed a simple method for holding work of this nature, but the shape of the piece itself made it possible to use a type of fixture which cannot always be adapted to inside holding. Fig. 391 shows an electrical unit *A*, the inside surface of which *B* is cored out, yet it is not possible for the operator to use a wrench to tighten setscrews as in the preceding instance. A simplified form of expanding pin chuck was therefore designed for this particular casting.

The body *C* is located on a plug *D* in the center hole of the boring mill table. Six pins *E* are spaced in suitable positions to give stability to the work and grip it from the inside. The pins in each tier are placed 120 deg. apart and their inner ends come in contact with angular surfaces *F* and *G* on the two cams *H* and *K*. The latter cam is threaded to receive the end of the operating bolt *L*. A coil spring *M* is placed between the two cams. A socket wrench used on the end of the bolt *N* operates the mechanism, thus moving the pins outward as much as is necessary to hold the work firmly. When the operating screw is loosened, the springs in the pin sockets release the pins, thus allowing the work to be removed.

A principle of a similar kind can be used on work where it is not possible to place a wrench on top of the fixture as in this case. Other means for operating the cams must be devised. Occasionally this is done by means of bevel gears and a socket wrench with a long handle extending beyond the edge of the table. Several methods are possible and the nature of the work governs the type of device found most useful.

Wants Standard Tapers

By C. Franklin Rothera
Head of Machine Department, Quincy Industrial School

While discussing standardization of tapers, will some one please consider the poor teacher of related mathematics for the machine shop? Many times have I fervently prayed for one standard taper, preferably the Jarno. I respectfully invite the gentleman who did not believe in standardization to endeavor to answer the queries of my pupils as to the reason for the differences in the tapers per foot of the Morse taper. Also why the Brown & Sharpe unaccountably jumps from the good standard of half-inch per foot to 0.5161 in. per foot in the No. 10.

I feel rather small when I have to confess to them that it seems like the perpetuation of an error, as also does the great diversity of the Morse tapers. These differences do not, and cannot, give the boys entering the machine trade a very exalted notion of the mentality of the heads of the trade.

I believe that standardization of tapers should come, and quickly, with the Jarno, for standard.

Selling a Tough Customer

By Hiram Strong

When I took the Western territory for H. & N. turret lathes, the fellow who had been there for fifteen years told me there were two places I'd better stay away from if I wanted to save doctors' bills. He'd been thrown out so many times he had callouses on his disposition and no sales to show for his pains.

One of these places was the big Jones Brothers plant where they should have been using twenty of our largest machines. Bill Jones who did the buying was a profane sort of a cuss who took delight in browbeating a salesman if he would stand for it, but he was a capable manager and bang-up mechanic just the same.

Well, my disposition has had to stand some pretty rough treatment and it's still about as healthy as it ever was, so I decided I'd see what I could do out there.

I got precious little satisfaction out of the first ten or fifteen visits I made but after that it got so Bill Jones got used to seeing me. When I'd come in he'd say, "Well, got a chip on your shoulder, this morning?" I'd say, "No, but I'll put one there if you want to knock it off." We had a lot of fights but finally I got a chance to figure on a new job to use four of our big machines. I put in my figures and you can gamble I was pretty sure they were right.

He looked over the figures. Then he burst out, "You know d—— well you can't do that!" I came right back at him with, "I know d—— well I can." Well, he fussed and fumed until finally I said, "What are you arguing about? It's up to me to worry about that performance, not you. Put it in writing if you want to."

At last he told me to go ahead and put in the four machines so he could prove I was a liar. That was all I wanted. When they came they had been run in and tested until they were as smooth as grease and I had the best two demonstrators from our shop to run them. I insisted that the Jones people get four days' work piled up around those four machines so there wouldn't be any hitches and then we started.

Things got going pretty good by afternoon of the first day and the word got around the shop that something was doing. Next day we did some better and Bill Jones was down there with a stop watch dancing around from one machine to another and looking sort of upset. I kept away from him until we were all through and checked up and could prove we had done 20 per cent better than my figures. Then I sent in my card.

He called me in and before I could get out a word he said, "Huh, come up here to say 'I told you so' haven't you?" "Yes," I said, "I have; what about it?" "You're all right," he replied, "I didn't think you could do it, but I take my hat off to you, those machines stay and I'll want some more before long."

I've never had any trouble getting orders out of that plant since, but can you imagine my chances if I hadn't made good on that job?

Features of the Reo Apprentice System

The Knowledge That Many Reo Executives Are Graduates Acts as an Incentive to Earnest Effort

SPECIAL CORRESPONDENCE

COURSES in apprentice training vary in many shops and it can be said that their success depends largely upon the attitude of the officers of a company toward the work. Where the training course is installed because it seems necessary in order to get boys, or because it seems the fashion, as in some cases, it is apt to be perfunctory and can hardly reach its maximum value.

One of the outstanding features of the apprentice system at the Reo Motor Car plant in Lansing, Mich., is the great personal interest taken in it by the officials of the company. R. H. Scott, vice-president and general manager, H. T. Thomas, chief engineer, and H. C. Teel, factory manager, served full time as apprentices. A. A. Lauzun, general superintendent, and George Rosa, toolroom superintendent, both well-known executives, served their apprenticeship under Mr. Teel and nearly all the division superintendents and many of the foremen were also apprentices.

With such examples of possible advancement to look forward to, such evidence that men who really learn the trade are sought after by the management for responsible positions, it is little wonder that the apprentices are enthusiastic and interested in their work.

There are three courses of study, each designed to meet specific conditions. The first or junior apprenticeship course takes boys from 16 to 20 years of age and with schooling from the eighth to the eleventh grades. This is a three-year course and includes machinists' work, toolmaking, tool and jig designing and drafting. Ninety per cent are taking the machinist course.

The senior course takes men 21 years or over, all returned soldiers or sailors coming in this class. This is a two-year course and covers the same subjects as the junior course. High school graduates under 21 years form a third class, with a 2½-year course on the same subjects as the others. Students sent by the Federal Board for Vocational Education come under Class II, the length of the course being determined by the Federal Board.

Each apprentice has a trial period of three months. If things are mutually satisfactory, he is asked to sign an agreement to serve the full course of apprenticeship. Graduates are guaranteed good positions with the Reo company, although they are of course free to go elsewhere if they desire.

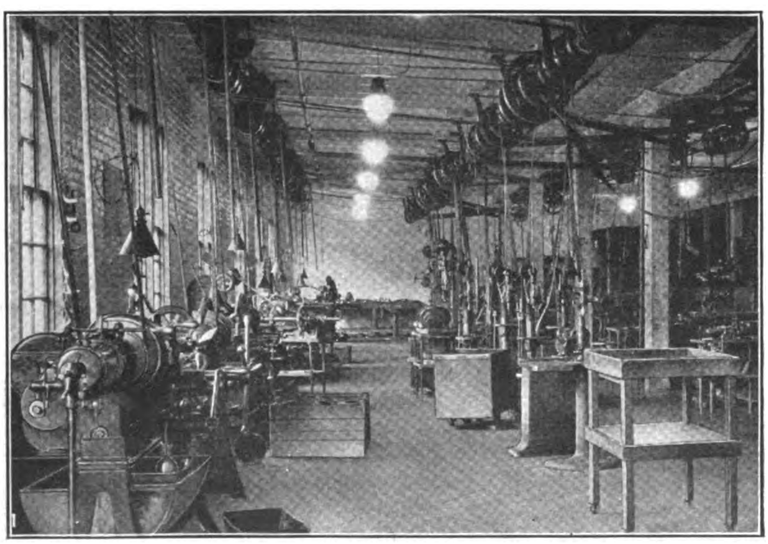
Courses in the trades mentioned vary with the individual. The course of each apprentice is outlined according to his inclinations and ability. Shop work consists of:

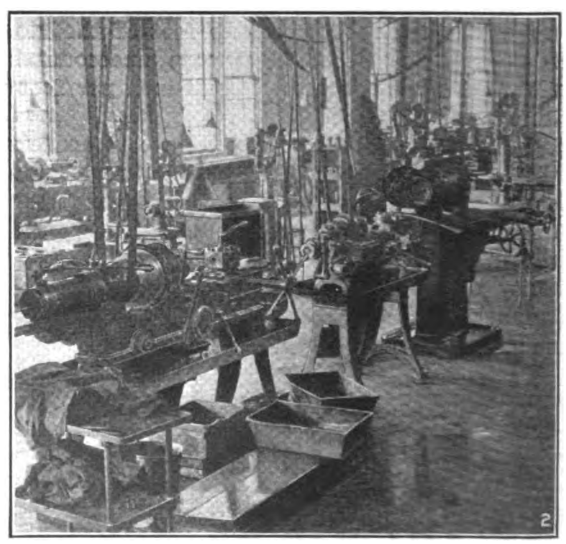
Inspection	2 to 3 months
Milling machine	3 to 5 months
Grinding	2 to 3 months
Bench	2 to 3 months
Motor assembly	3 to 4 months
Drafting	6 to 12 months
Motor test	——
Chassis test	——
Drilling	2 to 3 months
Gear cutting	3 to 5 months
Lathe	4 to 6 months
Axle assembly	2 to 3 months
Final assembly	3 to 6 months
Toolroom work	1 to 2 months
Coupe and sedan test	——

The vacant spaces have times which vary with conditions of the work.

The present apprentice school system began Oct. 1, 1918, and is an outgrowth of an older course that was almost wiped out by enlistment and draft during the war. The founder of the movement is H. C. Teel, the factory manager. The number of students varies, the maximum number which can be accommodated being 200. There were 165 on March 1, 1922. The classroom equipment can handle twenty students each half day, the average being 15.2 per class.

The training shop has forty machines of various kinds for instruction purposes, valued at approximately $10,000. Figs. 1 and 2 give some idea of the varied equipment provided. The shop also acts as a sort of reservoir, apprentices who have no work in their de-





FIGS. 1 AND 2. TWO VIEWS OF THE MACHINE EQUIPMENT OF THE SCHOOL SHOP

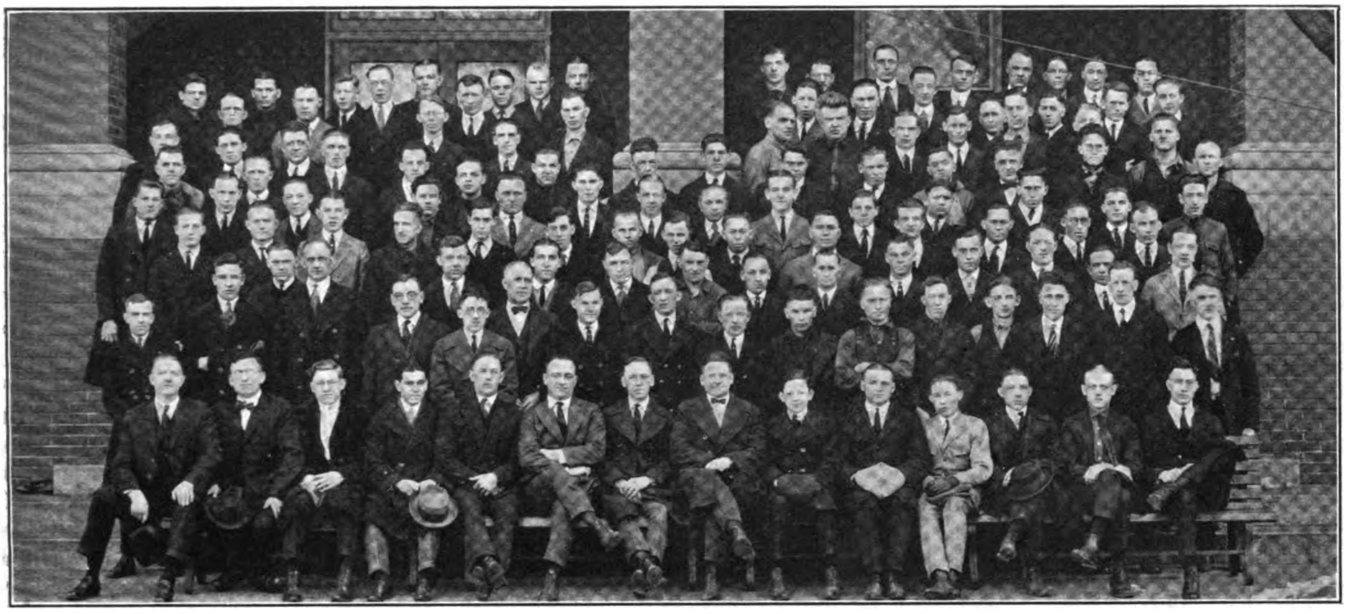


FIG. 4. A GROUP OF REO APPRENTICES

partments in the shop return to the training shop for further instruction.

The text books used are "Palmer's Practical Mathematics" (4 vols.), and the "American Machinists' Handbook." Twenty-six special lesson sheets on the latter have been prepared to show the boys how to find data in, and to otherwise use, the handbook to the best advantage. These lessons are mimeographed and consist of from six to twenty questions on various subjects. The solution of each problem is placed on the blackboard and is discussed by the class.

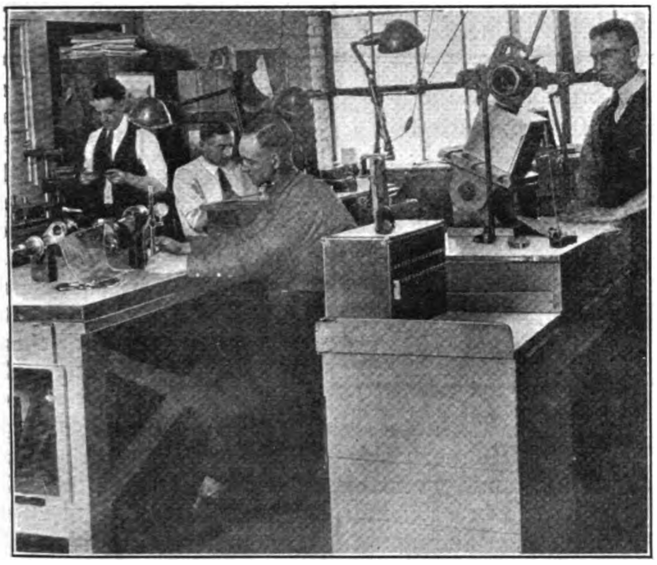


FIG. 3. LEARNING INSPECTION AND THE USE OF INSPECTION GAGES

In addition to the regular apprentice course, a night school is held in the apprentice department in connection with the public school department of Lansing. This covers twenty weeks.

Interest is maintained in the advanced apprentices by giving them opportunity to carry work through various stages and to make designs for simple jigs, tools and fixtures. They also repair machine parts, cut gears, make blueprints from their own tracings and machine parts complete in the apprentice shop. The apprentices work in all departments of the factory, and have the co-operation of all shop executives. One room is especially equipped for instruction on automobiles, and contains motors, axles, transmissions, electrical equipment and a complete chassis of both the passenger car and the speed-wagon.

Careful records are kept of each boy's progress and reports are sent to parents or guardians every three months. Those interested in the boys are urged to visit the plant and see the conditions under which they work. Records of apprentices who have completed the course are on file with the factory superintendent, the employment superintendent and in the apprentice department. These records show the time spent in each department and the rating in each. The complete record card is about 10 in. square and has room for a three-year record in both school and shop. These records make it possible to see at a glance just what each boy's progress has been from start to finish.

A good idea of the training given in inspecting and checking both rough and finished work is shown in Fig. 3. This room is for the more advanced students, all of those shown being ex-service men. Fig. 4 shows a group of 125 apprentices together with a few instructors, in front of the administration building.

Comparison Chart on Screw Threads

The Bureau of Standards of the Department of Commerce has just issued a chart entitled "Graphic Comparison of Screw Thread Pitches," which is now ready for distribution to anyone interested. Copies of this chart may be obtained by addressing the bureau. The chart is accompanied by a table, which shows the relation between English and metric screw thread pitches. Measurement of an English screw thread is ordinarily expressed in terms of the number of threads per inch, while in the case of metric threads the same thing is expressed in terms of the distance from one thread to the next, measured parallel to the axis; that is, in terms of the pitch. In this chart, a simple method has been devised for finding the nearest equivalent to one distance in terms of the other. The table is provided to give extreme values which cannot be conveniently shown in the chart.

Molds for Aluminum Castings

Brass Foundry Practice Modified for Light, Brittle Aluminum—Advantages of Green Sand Cores—Die Castings Stronger—How To Test Aluminum Castings

FROM SALES DEPARTMENT CONDENSED DATA PREPARED BY THE TECHNICAL DEPARTMENT, ALUMINUM COMPANY OF AMERICA

ALUMINUM IS LIGHT in weight and is brittle at a temperature slightly below the melting point. Provision for these two characteristics will obviate many of the aluminum molder's troubles.

Molding sand should provide for the escape of air, steam and gases, but should give a smooth, clean surface.

Chills and risers prevent sponginess and cracks.

A core should be hard at ordinary temperature, but should soften and crush with intense heat.

Small die castings are stronger than sand castings. They also have a greater elongation, more accurate, uniform dimensions, smoother surfaces; and can be produced in large numbers at a lower cost.

ALUMINUM can be cast by the same general methods used in the casting of brass and bronze, but with certain modifications dependent upon its various physical properties. The purpose of the following information is to point out where these changes in method should be made and to state in general what is considered the best practice. In the selection of molding sand for an aluminum foundry the texture or mechanical composition of the sand is much more important than its chemical composition. A good molding sand should be neither "close" nor "open." If it is too fine it will not be free-venting and will, therefore, prevent the escape of air, steam and gases. On the other hand, it should not be too coarse or it will fail to give a smooth and clean surface to the casting.

The sand most generally used in aluminum founding is Albany OO molding sand. The clay in this sand forms such a good natural bond that no artificial binder, such as flour, treacle, dextrin or sulphite-lees, is needed. All that is necessary is to riddle the sand through a No. 4 sieve to remove all large foreign substances, to moisten it and to thoroughly mix it; then it is ready for use. Just enough water should be added to the sand to give it the required bond; additional water only obstructs the escape of the steam generated and the gases given off by the molten metal.

No specially prepared facing sand is required. When riddled through a sieve ranging in size from No. 8 to No. 20, depending upon the casting in question, the regular molding sand makes a good facing for the pattern. Additions to the sand for the purpose of forming a smoother surface for the mold and increasing the bonding qualitis of the sand, are harmful, for they make the sand impervious to steam and gases. The practice of facing the pattern with good sand and using almost any kind of sand as a filler-up is a bad one. The saving realized in the cost of sand is more than offset by the loss in defective castings due to poor molds.

The usual method of putting the new sand into service is to add small quantities of it at frequent intervals to the old sand. With each additional use the molding sand loses some of its bond. The molten metal drives off the water and kills the clay which comes in immediate contact with it. The water bond is easily replaced by the addition of more water each time the sand is used, but due to the loss of clay, a gradual wastage in the strength of the sand takes place. The sand must then be revived by the addition of new sand, and so a few shovelfuls of the new molding sand are thrown into the old pile of sand whenever it exhibits signs of weakness. Inasmuch as sand tempers best when it is steaming, water and new sand are usually added immediately after the castings have been shaken out.

Careful observation of the two following characteristics of the common aluminum alloys will obviate most of the troubles of the molder: Aluminum alloys are light, for iron or brass are two to three times as heavy; and they are brittle or "hot short" at temperatures slightly below the melting point. In casting aluminum practically every modification of the usual brass foundry practice is attributable to one or the other of these reasons, and any steps taken which provide for these peculiarities are in the right direction. A consideration of the first characteristic will explain why certain practices in ramming, venting, gating, and feeding the mold employed in brass foundries cannot be used unmodified when casting aluminum. Aluminum is so light that it cannot rid itself of absorbed gases and drive off the steam as readily as brass. Observance of the second characteristic will prevent cracks in the castings due to hard cores or molds. If the cooling metal when in its "hot short" condition encounters very much resistance to further shrinkage it will almost invariably crack.

Because of the lightness of aluminum alloys the mold may be made in a snap flask which may be removed when the mold is completed. The sand should be rammed as lightly as is consistent with safe handling and pouring of the mold. Additional ramming serves only to create an impervious wall which will prevent the escape of the imprisoned air, steam and gas, forming blowholes, and producing a rough surface to the casting because the metal cannot lie close to the mold. Hard ramming is also objectionable as it prevents the mold from giving when the metal shrinks, for it must be remembered that certain parts of the mold, as well as the cores, are called upon to give way to the metal in contraction. To help the mold to keep its shape after the flask has been removed, the outside of the mold may

be rammed fairly hard, but the hard ramming should never extend to the sand immediately adjacent to the pattern. A close adherence to the principle of light ramming will probably obviate most of the aluminum molder's troubles.

The mold should be well vented for the same reason that the sand should be rammed lightly. In the case of large castings especially, the minute openings resulting from the porosity of the molding sand are an inadequate outlet for the steam and gases, and venting must be resorted to. For small castings vents are often unnecessary.

Low Gates and High Risers

No set rules can be laid down to govern the number, size and location of gates, for each particular casting presents a different problem. This must be left largely to the discretion of the molder, who should always bear in mind the two characteristics of aluminum alloys before mentioned. One or two general suggestions, however, may be given. A liberal fillet should always be employed where the gate connects with the casting in order to avoid drawing just beneath that point. If increasing the size of the fillet does not entirely eliminate trouble from drawing, the gate should be so located that the unsound part of the casting caused by the draw will do the least amount of harm. If possible, it is also good practice to so locate the gate that when the mold cavity is filled with metal, the length of the path traveled will have been such that the heavy sections will have filled first and will be colder than the light sections. It is also generally true that the gate should enter the casting at a low rather than high point, for less air is imprisoned in the mold by gradually rising metal than by falling metal. Due to mechanical difficulties, however, all these suggestions are subject to a limited application.

Risers are usually attached to those parts of the casting which solidify last. The parts which first solidify draw metal from the larger, slower-cooling sections, so the latter sections must find a source of supply sufficient to provide metal for both its own shrinkage and that of the smaller fast-cooling sections. Risers are constructed to create such a source of supply. They must be so located and of such a size that they will remain molten longer than the casting. Otherwise, they simply act in the same way the small sections of the castings do, and draw metal from the large section, making matters worse rather than better. If possible, the riser should enter the casting at its highest point so that the air and dross may be forced up into the riser instead of being trapped in the casting. By increasing the height of the riser, the pressure of metal may be increased, and consequently, sounder and sharper castings will result. On small castings risers are seldom necessary.

Chills may also be used as a safeguard against injurious shrinkage, especially in large castings of irregular section. Where light sections of the casting join heavy sections, uneven cooling takes place. The light section cools first and, in cooling, is fed with metal from the still liquid heavy section. When the heavy section finally cools it draws from the light section, causing sponginess and sometimes cracks in the junction between the two. To correct this tendency some means of artificial cooling must be adopted which will make the heavy section set as fast as the light section. Chills are used for this purpose, and the pieces of metal are so placed in the surface of the mold that they will come in immediate contact with the heavy section of the casting.

It will thus be seen that chills serve much the same purpose as risers, the difference lying principally in the method employed. Risers prevent sponginess and cracks in the junction between two sections by supplying the larger section with molten metal as it shrinks, while chills accomplish the same result by making the two sections cool at an equal rate. Chills are also used for other purposes. They are often employed to give a hard, smooth surface to certain parts of the casting. A harder surface than is usually produced is often necessary if a part of the casting is to be subjected to unusual wear, while a smooth surface often eliminates machining.

Cores for aluminum castings should be made as soft as is consistent with safe manipulation. Because of the "hot short" condition of alloys at high temperatures, it is particularly important that they give way to the shrinkage of the cooling metal. A good core should be hard enough to be safely handled at ordinary temperatures, but should soften and crush when subjected to the intense heat of the molten metal, since the slightest resistance to the shrinkage of aluminum when it is in this fragile state, will usually result disastrously.

A good core sand should consist of a mixture of sharp sand and molding sand in varying proportions, held together by some such binder as rosin, flour or core oil. The sharp sand furnishes good venting qualities to the mixture. The molding sand adds strength to the cores before they are baked and produces a smooth surface to the casting. Rosin is probably the best binder to use, for on coming into contact with the molten aluminum it softens, permitting the core to give as the casting shrinks. In some core sands a small amount of flour is used in addition to the rosin to assist in binding the mixture together until the cores are baked. The rosin has no binding power until it has first been melted and then allowed to harden. Linseed oil and various patented core oils are also successfully used as binders by some foundrymen.

A sand mixture for cores that will crush and prevent cracking is composed of the following ingredients:

Sharp Sand	45 parts
Molding Sand	45 "
Powdered Rosin	2 "
Flour	1 "

After this mixture has been moistened to the correct degree of dampness, it is ready for use. The core should be rammed lightly and should be freely vented. This precaution is more important in the construction of the cores than of the mold proper for, unlike the mold, the core is almost completely surrounded by the metal. The completed core should be sprayed with molasses water, baked in an oven hot enough to melt the rosin thoroughly, and then given a soapstone wash to secure a smooth finish.

Green sand cores are molded from the regular sand which is used for the mold itself, and require no binder other than water. They are skin dried with a blow torch, immediately before setting in the mold. At present green sand cores are used principally for large body cores in casting automobile crankcases and oil pans. With proper development there is no reason why their use cannot be greatly extended to such parts as

manifolds, bearings, flywheel housings, and gear cases. They can not be used for small cores of intricate shape for ramming up, nor in places where the core print support is limited in size or position.

A comparison of the costs of each type shows:

Labor of ramming and rodding each type to be about the same.

A saving in the case of green sand cores due to: Elimination of trucking from core bench to rack, to oven, and from oven to cleaning bench and to stock racks; elimination of baking; elimination of binders other than water.

Green sand cores require less cleaning and patching and can be handled with less breakage.

Loss of defective green sand cores is about one-quarter that of dry sand cores.

Green sand cores, since they are made of the same material as the mold, have an equivalent chilling effect which promotes uniform solidification of the metal. Baked sand cores, on the other hand, have but a fraction of the heat absorbing power of green sand, therefore induce non-uniform solidification with the resultant shrinkage crack.

The crushing strength of green sand cores is from 1 to 3 pounds per square inch or about 1/100 that of baked sand cores. This is an important consideration in connection with the very weak condition of the metal just below the solidification point when the solid shrinkage is taking place.

The green sand core is more easily knocked out with some saving in cost as a result.

Green sand cores give a fine smooth surface.

Green sand cores have a few disadvantages:

The breakage percentage of green sand cores in the mold if not carefully set, is greater than that of baked sand cores.

Side draw boxes are generally used for green sand cores, and are more expensive to make and maintain than the rods for dry sand cores.

The design for a green sand core box is usually more intricate than that for dry sand.

Die Casting

The art of die casting is not new. For many years, zinc, lead, and tin have been successfully cast in this manner. Aluminum die castings, however, are of comparatively recent development. A copper-aluminum alloy is most frequently used with copper content running from 8 per cent to 10 per cent.

It would naturally be supposed that castings made under pressure would be dense and homogeneous. On fracture, however, it is found that only the surface or skin of the casting is dense and close-grained while the inner structure is porous. This applies particularly to the larger castings; smaller ones can usually be cast very satisfactorily. Another cause of trouble has been the cracking of the casting due to resistance to shrinkage offered by the metallic cores, but this trouble has been largely removed by the use of collapsible cores.

When properly cast and when too large castings are not attempted, there is much to be said in favor of die castings. They can be produced in large numbers at a lower cost than sand castings. Their dimensions are more accurate and uniform than similar castings cast in sand. In addition, the surface of die castings is so smooth that machining may often be dispensed with where it ordinarily would be necessary. Die castings are also stronger than sand castings and have a greater elongation. Because of these advantages indications point to the more extensive application of die casting in the future to the larger scale production of small parts.

It is important to standardize methods of testing aluminum castings in order that results obtained in one foundry may be comparable with those obtained in another, or that tests made one day may check up with those made at another time. The test specimen recommended by the Society of Automotive Engineers and the one most generally used is a cast-to-size bar ½ in. in diameter at the breaking section and filleted to a ¾ in. diameter threaded end. The fillet should not be less than ⅜ in. radius. The test bar should be cast in sand, the use of chills or artificial means of cooling is prohibited. The gage length for aluminum should be 2 in. The ends are threaded in order that the bar may be pulled in a self-centering type of machine which exerts a straight pull on the bar.

The American Society for Testing Materials recommends a similar bar, but machined to size rather than cast to size, in order that the diameter at the breaking section may be more accurately measured. In ordinary foundry practice the increased accuracy of the test due to machining the breaking section and threading the ends is not considered sufficient to pay for the cost of machining, and so the test bar is usually cast to size and pulled in wedge grips. Even the ideally designed and cast test specimen is not without its limitations, for it can only be expected to give approximate results for the metal in the casting which it is supposed to represent.

The test bar checks the history of the metal up to the time it goes into the mold. It gives no check whatever upon the molding variables, except when the bar is attached to the casting, when it reflects certain, but not all, of the variables and in addition it gives no check on the design of the casting. The only way in which to secure such checks is to cut the casting up into parts and take test specimens from each part. Such an experiment will indicate considerable variations in the physical properties of the different parts, for unless molding practice and design are perfect the physical properties of a casting are bound to vary from point to point.

These variations are due to shrinkage, gating methods, the chilling effect, the personal element in foundry work and the design. When it is understood thoroughly to what an extent the physical properties of a casting are subject to control by variations in the melting conditions, the molding practice and the design, a long step will have been taken toward a better adaptation of castings to the purposes for which they are intended.

The Foreman and Management

By A. W. Brown

In one sense, the foreman is part of the management; in any case he is by no means to consider the possibility of his being arrayed against it, when the interests of employers and workers conflict or give signs of doing so. Having power delegated from above, he should not consider that he has any right to attempt exerting it upwards. He cannot "run with the hare and chase with the hounds"; cannot "be all things to all men" or "carry water on both shoulders."

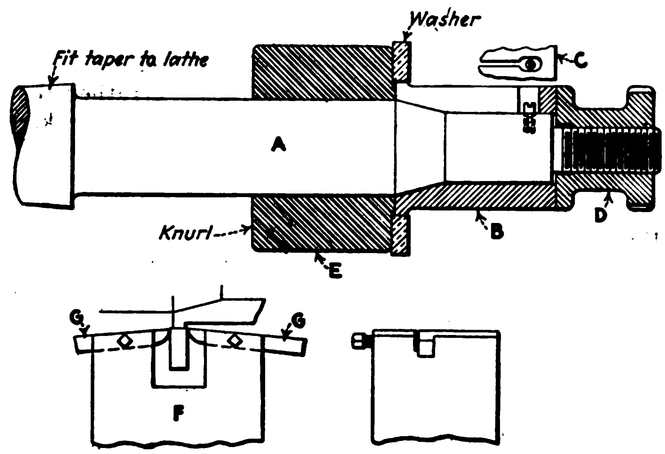
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Arbor and Toolblock for Facing Thrust Washers

By K. M. Holt

The arbor shown in the accompanying sketch was used for facing brass alloy thrust washers 3½ in. outside diameter, 2¼ in. inside diameter and ¼ in. thick.



ARBOR AND TOOLBLOCK FOR FACING THRUST WASHERS

The requirements were that the sides should be flat and parallel with one-quarter of a thousandth, and with a smooth polished surface.

The washers were made from castings and were first bored to micrometer size and faced on both sides in a chuck, leaving them approximately 0.010 in. large in respect to thickness. They were then turned on the outside diameter in gangs on an arbor.

The final facing arbor *A*, shown in the sketch, was centered on both ends and one end tapered to fit the lathe spindle. The other end was machined as shown. A cast-iron expansion bushing *B* was made and slotted in four places as shown at *C*. A small screw pin was tapped into the arbor to prevent the expansion bushing from turning. A hand nut *D* was provided for clamping. The outside diameter of the bushing was turned very carefully to size after slotting and being expanded slightly on the arbor.

A thrust washer was passed over the nut and bushing and located in proper position by means of the sliding sleeve *E*. The hand nut was then tightened to clamp the washer, the sleeve *E* moved to the left out of the way and the tail center brought into position.

The double toolblock *F*, with toolbits *G*, was fastened to the toolpost slide and the lathe geared for a very fine crossfeed.

With the arbor stationary and tools set to give the desired thickness, the toolblock was moved in by hand until the tools were up close to the bushing, the tools passing through radial oil grooves previously milled in each side. The lathe was then started and the tools fed outward by power feed.

With the tools properly ground, no trouble at all was experienced in holding the washers to the desired limits of accuracy and finish with only one passage of the tools, and the entire operation of loading, facing and unloading took only about three-quarters of a minute per washer.

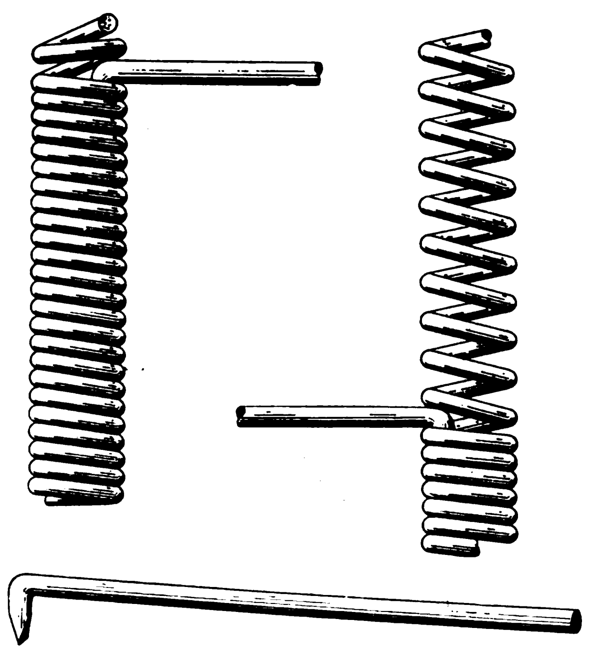
Opening a Coil Spring

By Walter E. Schmidt

Nearly every machinist has had occasion to open or lengthen a helical spring, and when the spring is tempered and of thick wire it is quite a job by the usual hammer and chisel method, more so when it is a rush repair job. The method I use, while simple, is very efficient and will open almost any helical spring with comparative ease.

Take a piece of round steel or iron of convenient length and bend one end to form a hook; then grind or file the end of the hook to a wedge point as shown in the sketch. With a chisel or other pointed tool pry open the first coil of the spring, insert the wedge end of the hook and force it in until the handle stands at a right-angle. Then clamp the closed end of the spring in a vise and turn the hook in the direction in which spring is wound. The spring will open up with ease.

The diameter of steel used for the hook is governed by the temper, size and length of the spring, or the



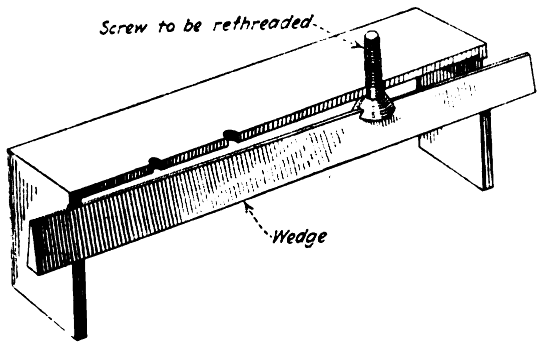
SPRING-OPENING TOOL

pitch of coils desired. I advocate the use of this method only until a new spring of the proper length can be wound.

A Few Kinks for the Machine Shop

By K. Saldiz

A contribution to a recent issue of *American Machinist* advises the use of rubber "wedges" to hold hammer handles in place. It may be of interest to the readers



DEVICE TO HOLD SCREWS FOR RE-THREADING

to know that a properly fitted wooden wedge is much superior to other kinds. The handle should be nicely fitted to the eye of the hammer head, and split by driving in a clean hacksaw blade. The wedge should be coated with shellac and, after driving in place, allowed to dry for a day or two. I have a hammer handle that was so fitted over six years ago and it is still tight.

If a tap binds in cast iron when backing it out of the threaded hole, a little water squirted alongside the flutes will loosen it up and save the tap as well as the temper of the workman.

If a drill binds when drilling aluminum, lubricate it with gasoline. Coal oil will help some but is not as good. If a file clogs when filing aluminum, dip it in lard oil occasionally.

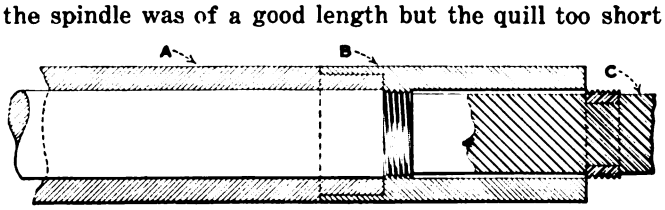
The sketch shows a little device that I made some time ago to assist in re-threading small machine screws. It consists of a piece of heavy sheet iron bent as shown and provided with slots through the legs to admit a wedge. The wedge binds the head of the screw against the under side of the plate and holds any kind of head firmly.

Lengthening a Drilling Machine Quill

By George Wilson

While the quill of the average drilling machine has travel enought for ordinary drilling jobs there are a lot of boring, spot-facing and other machining operations in connection with jigs that could be done if the spindle travel was long enough to permit the removal and insertion of boring bars having comparatively long pilots. A case in point is the machining of pinholes in gas engine pistons where the piston is held in a jig having a drill guide bushing, the drill to be followed by a piloted boring car and reamer, as it is not advisable to swing the table and thus lose the alignments each time the tools are changed.

Having a machine of the sliding head type, in which the spindle was of a good length but the quill too short



EXTENDED QUILL FOR DRILLING MACHINE

for the proposed job, the quill was lengthened as shown in the sketch. The quill *A* was placed on a mandrel and shouldered down on its upper end. A new section of quill *B* was made of machine steel and tightly fitted upon the end of *A*. The new part *B* was left oversize to allow for a cut to be taken off the outside diameter after assembling.

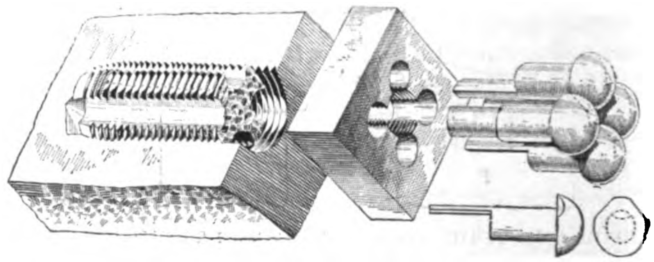
New threads for the retaining nut had to be provided at the end of the extension. This was done by cutting a shallow rectangular shaped groove in the spindle as at *C*. A steel ring was made slightly larger than the outside diameter of the required thread and bored to fit the bottom of the groove. This ring was then split and sweated into the groove with soft solder, after which the spindle was placed in a lathe and the ring turned to size and threaded. The extension was then slabbed off and a new section of rack fastened on.

Improvised Extractor for Broken Taps

By Thomas Davies

The accompanying sketch shows an extractor for broken taps that was improvised from an old solid threading die and four rivets.

The heads of the rivets were of such size that, with two sides of each head flatted, the rivets, when driven



IMPROVISED TAP EXTRACTOR

into the clearance spaces of the die, were locked against turning. The device was placed in the lathe and the shanks turned, as shown in the sketch of one of the rivets, to a diameter that would allow the device to enter the threaded hole, the shanks of the rivets passing into the flutes of the broken tap.

With a wrench upon the square threading die the remains of the tap were easily withdrawn.

A Couple of Shop Kinks

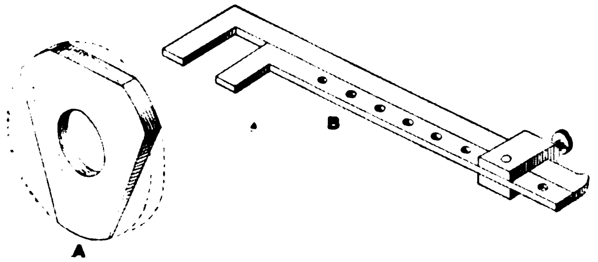
By C. G. Spicer

To make a satisfactory wedge for holding the handle in a hammer, take an ordinary washer of a size suitable to the job and cut it into a triangular shape as shown at *A* in the sketch. By using a file or a disk grinder the lower corner of the crude triangle thus formed can be thinned somewhat until the piece has assumed the shape of a blunt wedge. When it is driven into place in the split end of the handle, the fibers of the wood will sink into the hole and prevent the wedge from backing out. The writer has a number of hammers wedged in this way that have been in service for years.

A cheap and quickly made slide caliper is shown at *B* in the same sketch. The tool is often convenient for the purpose of measuring diameters or distances upon work in confined places that cannot be reached by the ordinary form of caliper. It is not intended as a precision tool.

It may be made of cold-rolled steel of suitable size

by bending over the ends and finishing the surfaces with a file or disk grinder. The yoke must be milled out to go over the slides and is pinned to the lower one. By using a taper pin and making several correspond-



WEDGE FOR A HAMMER HANDLE AND A SIMPLE SLIDE CALIPER

ing holes in the lower slide the yoke may be used anywhere along the length of the slide that may be convenient for the work.

Babbitting Device for Ford Caps

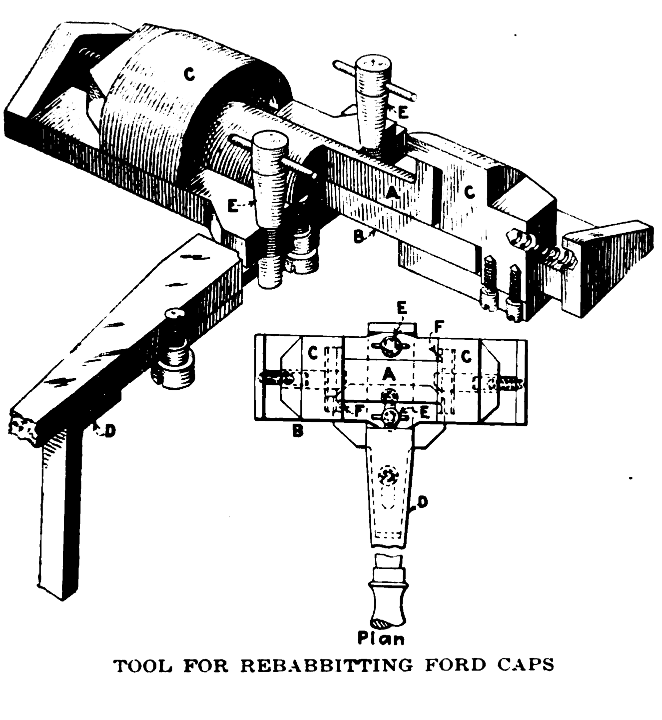
By Walter R. Place

The cost of replacements for Ford automobiles is so insignificant that one would hardly expect worn parts could be reclaimed at a profit, yet the device here shown for rebabbitting bearing caps has proved to be a real money maker. It was designed by Martin Iblaner of the Lorain Machine Works, Roselle, N. J.

The mandrel *A* is turned to a diameter 0.002 in. under the standard size and the flanges spaced the proper distance apart with the shoulders beveled slightly outward to facilitate the removal of the cap after pouring. This mandrel is secured by screws and dowels, not shown, to the part *B*, which may be considered the base of the device.

Parts *CC* are arranged to slide endwise on the base and are held in closed position by coil springs. They serve to hold the cap in place while the babbitt is being poured and to prevent the liquid metal from leaking out around the end. They can be separated by a movement of the cam plate *D*, located under the handle.

Studs *EE* have tapered bodies which serve to locate the cap in position for pouring the metal. Two small



TOOL FOR REBABBITTING FORD CAPS

holes *FF* through the base provide gates for casting and also act as air vents. The device is inverted to pour the babbitt.

When the casting has been sufficiently cooled the studs *EE* are removed, the cam plate *D* moved forward by means of the bent handle and the device struck sharply over a block of wood or upon the bench, causing the cap to drop out.

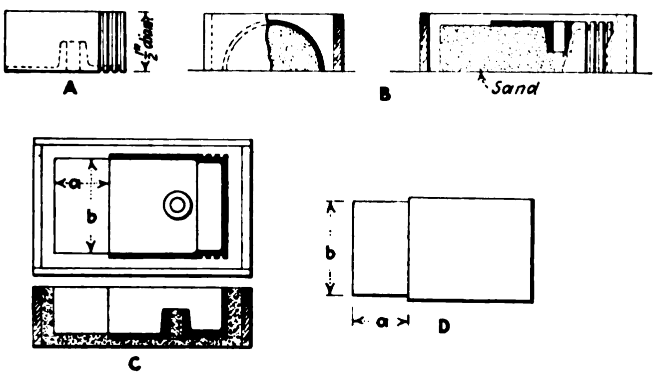
The operations are very quickly repeated and by merely cutting off the two small projections corresponding to the pour holes and scraping the babbitt to fit the shaft, the new cap is ready to go to place.

Simple Corebox for Gas Engine Piston

By Henry H. Knabe

The sketches show a quick and easy way to make a corebox for a gas-engine piston, a job that often has to be performed in small foundries when new pistons are required for repair purposes.

Saw the old piston apart lengthwise, as shown at *A*, so as to get one exact half of the casting. Make a rectangular frame of wood of suitable dimensions and lay it over the half piston as at *B*. Pack moist sand



COREBOX FOR GAS ENGINE PISTON

under the piston, being careful not to fill the pinhole, and allow the sand to project beyond the skirt of the piston to form a print, which must be carefully rounded to conform to the contour of the piston.

Next mix plaster of paris to a proper pouring consistence (not too thin) and fill the box level full. When the plaster has hardened invert the box and scoop out the sand, leaving the piston in place. This forms a corebox *C* in which a core is made from core sand in the regular way.

The pattern is now nothing but a shouldered cylinder of wood as at *D*, with the dimensions *a* and *b* conforming to the corresponding dimensions of the corebox.

Planing Flat Gibs—Discussion

By Edward Schroeder

Referring to several articles under the above subject that have appeared in *American Machinist*, the writer would like to say that in the early days of his apprenticeship, he planed quantities of flat gibs.

The gibs, one or more at a setting, were roughed to within $\frac{1}{32}$ in. of finished size. They were held down on the planer by bunters, and pressed against a parallel tongued in one of the T-slots of the planer by setscrews. After the scale had been removed, some of the holding pressure was released and a light cut taken

from one side with a narrow, square-nosed tool. The gib was then released and turned over on the planer table, and if found to be sprung or warped it was gently tapped with a lead hammer to straighten it. If the gib was not out of wind, tissue paper in narrow strips was packed under one corner, or two diagonal corners, and another light cut taken over one side which generally brought that side true. A cut was then taken on the opposite side, bringing it to size and making it ready to be scraped in.

By this method no tapping with a lead hammer is necessary, except after the first roughing cut.

It is most important that packing up the corners be properly done, also that too much pressure is not exerted by the screws at the time of taking the finishing cuts.

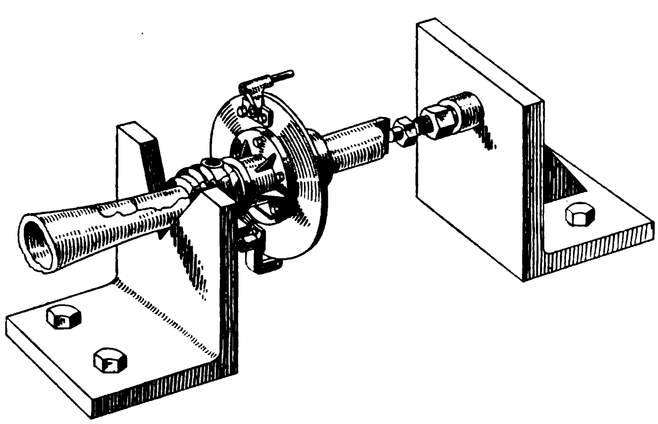
Of course, with a magnetic chuck a quicker job could be done, but we did not have one in the shop when I was planing gibs.

Removing a Cracked Axle Housing

By Daniel F. Smith

The accompanying sketch shows how we pressed a cracked axle housing out of the brake rigging by means of an improvised forcing press, using a small screw jack to apply the pressure.

The shoulder of the brake rigging was placed against



IMPROVISED FORCING PRESS

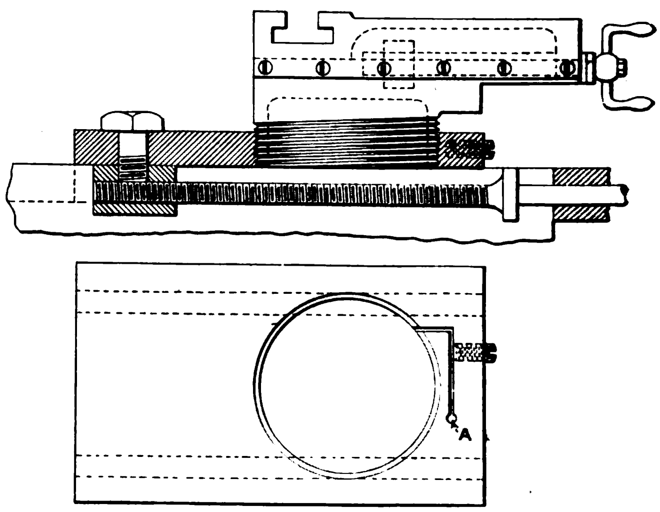
the face of an angle plate, in the top of which was a V-shaped opening, and the jack against the face of an opposed angle plate, both firmly bolted to the table of a large planer. With a short piece of shafting against the end of the housing, and centered over the jack, a pressure of 2,500 lb. was available and by this arrangement the housing was pressed out without injury to any of the parts.

Method of Clamping a Swivel Head

By J. V. Romig

In designing special machinery it is sometimes necessary to provide means of clamping a swivel head in any desired angular position, as the head of a planer or the compound rest of a lathe. For this purpose the writer devised the scheme shown in the cut, which is very easy to apply and will hold the head firmly under any reasonable degree of pressure.

The first job to which I applied it was on the rebuilding of several small lathes that originally had only a plain slide, but which it was desired to fit with compound rests. In this case the cross-slide is bored and threaded with a relatively fine-pinched thread and the bottom of the compound rest is threaded to fit nicely. Then a hole is drilled as at *A*, and a slot is sawed,



CLAMPING SWIVEL HEADS

starting from this hole, to meet a slot that starts from a point on the circumference of the threaded hole. This leaves a weakened section of thread that may be forced against the male thread by the pressure of a setscrew tapped into the end of the slide.

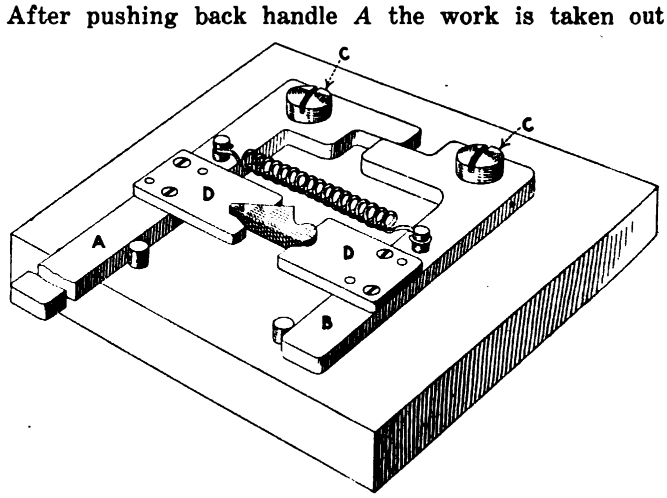
A head so clamped is very firm as it is held in a horizontal position by the threads themselves, while the clamping action of the screw against the weakened section keeps it from turning. This action does not distort the slides, a very valuable feature where accuracy is required.

Convenient Nest for a Shaving Die

By Franklyn Smith

The writer recently constructed the shaving die shown in the cut, which permitted the nest to be operated by one handle, making it much easier and quicker than the usual two handle nest. This nest can be operated with the left hand and loaded with the right hand.

The handle *A* is pushed back, thereby throwing back the handle *B*, the handles pivoting on screws *C*. The nests *D* are doweled and screwed to handles *A* and *B*. After pushing back handle *A* the work is taken out



NESTING WORK ON SHAVING DIE

and the handle released. The spring brings both handles back against their respective stops, when the device is again ready for loading.

Editorial

More Business in Government

POPULAR interest was immediately awakened by the slogan "More Business in Government." It tickled the public fancy and, as usual, the public sat back and waited for somebody else to put into effect the system that was to reduce taxes, decimate the army of office holders in Washington, eliminate waste and accomplish sundry other highly desirable reforms.

Results have hardly come up to expectations. A budget system is in operation so far as the administration is concerned, but Congress has shown little hesitancy in disregarding budget figures where political capital was at stake. A few clerks from government departments have had to find jobs elsewhere but there are very many still on the job. Perhaps the only way to dispense with their services will be to declare them surplus and turn them over to Col. Smither to dispose of. The reorganization of federal departments and bureaus has failed utterly to materialize.

Who is to blame for the failure of the result crop when such good seed was planted and so much was expected of it? To carry the simile a little farther we might say that it is the fault of the husbandman, the citizen of this big country, who has sat on the doorstep and whittled or gone fishing instead of doing his utmost to insure the production of a good crop of the desired results. Nature has been allowed to take its course unaided and little else than what has happened could have been expected.

What is to be done about it? Just this—the merchant and the manufacturer, the employer and the employee, the capitalist and the laborer have got to get over the idea that politics is a dirty business, defiling to all who get mixed up in it, and step in and make it an honorable venture.

When it comes to politics, distinctions of class or station in life seem to fade out and we all become pretty much alike, too busy or too lazy to take the proper interest in a matter which affects all of us vitally. As a result of this general indifference it has become entirely too simple in this country of ours, for the organized and vociferous minority to put things over on the unorganized, passive, and good-natured majority.

Some of us carry hardly enough weight to make much of an impression in national politics, but the political structure is so made up that none of us is so insignificant that he cannot make himself heard in his local unit.

As a nation we are rapidly approaching a point where politics must be one of the first considerations of every citizen. As a world power we need bigger leaders than we did as a relatively isolated country. Their vision must be broader to take in the viewpoints and peculiarities of men of other nations as well as their own. Their political education must be more complete if they are to lead the rest of us who are not so well versed in its windings.

Until we take pains to select men of this character to represent us in legislative bodies and as executives, we can hardly expect to escape from the blowhards and demagogs who are eager for positions of prominence. Unfortunately, the right kind of public official is not an office seeker. He must be sought out and by the right kind of seekers if he is to make the personal sacrifice usually inseparable from public life.

If you men of the machinery industries are anxious for the kind of political representatives you ought to have, it is up to you to take a hand in selecting and electing them. The results will be just about commensurate with your efforts.

Unions Can Be Sued

THE decision of the United States Supreme Court handed down in the Coronado Coal Co. case last week is generally conceded to be the most important labor decision since the case of the Danbury hatters. Under its terms the liability of labor organizations to be sued is clearly defined.

The leaders of organized labor have always contended that as labor unions were not incorporated they could not be sued, and this decision is consequently a body blow to them. They at least have the consolation, however, that according to the court the central organization cannot be held responsible for unauthorized strikes indulged in by local or district bodies. Their power over these smaller units should be greatly increased thereby.

To the general public, which is not particularly partisan in labor disputes, the decision will appeal as the only one possible in common fairness. Just why labor organizations have been immune from the penalties of breaking certain laws has always been a mystery to us, and the Coronado Coal decision consequently goes far to restore our faith in the fairness of the bench.

Incidentally, hot-headed strike leaders will probably be restrained by cooler counsel when it is realized that damages for which the unions are responsible can be levied against their treasuries.

The Commencers

ABOUT this time every year the colleges and technical schools of the country send forth a flood of ambitious young men who have much to learn and perhaps more to unlearn.

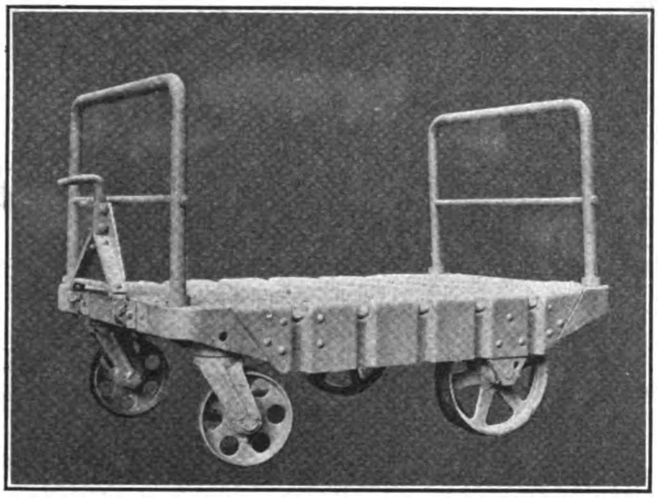
Few of us give the proper significance to the word "Commencement." To most of us it indicates the completion of the young man's period of preparation and he is assumed to be ready to earn a living. A more literal interpretation of the word would really be much nearer the truth, for the great majority of these boys are just ready to commence learning, and their earnings are likely to be small for some time to come.

A word to you hard, practical men who will soon have the job of driving common sense into their heads. It will undoubtedly be a pleasant duty for you to show them how little they know, but remember that it is a terrible drop from the exalted position of a college senior to that of the newest boy in the shop, and you can't expect all of them to land on their feet the first time. Temper justice with mercy.

Shop Equipment News

Elwell-Parker Wheeled-Platform-Trailer

The Elwell-Parker Electric Co. of Cleveland, Ohio, has just placed on the market, to be used with its line of electric elevating platform trucks and tractors, the



ELWELL-PARKER WHEELED-PLATFORM-TRAILER

wheeled-platform-trailer shown in the accompanying illustration. The platform of the trailer is made of corrugated steel plate with deep aprons on each side. This platform rests on 4-in. longitudinal channels which are riveted to malleable castings at the four corners.

In front the trailer is equipped with ball-bearing caster wheels of the swivel type. The fixed rear wheels, on roller bearings, are carried in forged-steel yokes riveted to the top and the side. All bearings are provided with pressure lubrication. The caster wheels are 10 in. and the fixed wheels are 15 in. in diameter. The trailer can also be provided with end or side standards and with a coupler. If desired, it may be equipped with four casters, instead of two casters and two fixed wheels. Where required the wheels may be fitted with 10- and 15-in. solid rubber tires.

For use with electric lift trucks, the trailer has been provided with clearance between the wheels sufficient to permit the lift truck being driven beneath the platform. When the lift truck elevates, the load is supported by the two longitudinal channels under the platform. When used as a trailer, the unit is fitted with hook and eye couplers, or chain couplers.

The unit weighs 600 lb. and has a capacity of 6,000 lb. It is especially adapted for transporting materials in shops and warehouses, and at railway and steamship terminals.

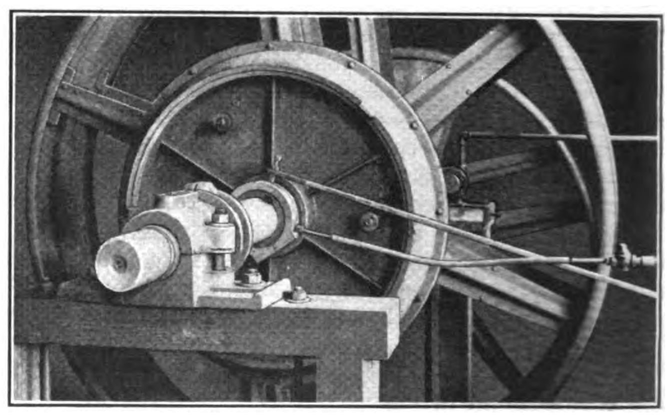
Dickson Pneumatic Clutch

The Rogers Foundry and Manufacturing Co., 11th and Pearl Sts., Joplin, Mo., has just placed on the market the pneumatically operated clutch shown in the accompanying illustration.

The clutch consists of two disks with cork-covered conical faces on their periphery. These disks are closely fitted on a hub and are driven by pins through a triangular plate which is a part of the hub. An air inlet is fitted on the hub in such a manner that the air can be fed through the hub between the disks while the hub is revolving. The two disks are fastened together at the periphery with a flexible, air-tight connection. This arrangement allows the disks to move longitudinally on the hub, although during the slight movement that can occur the flexible connection merely bends and the chamber is kept air tight.

When air under low pressure is admitted between the disks through the air inlet, the disks spread apart. This action forces the conical friction surfaces of the disks into contact with the outer case, which has similar conical faces. This case is carried on the ball-bearing quill. The pins which drive the disks are fitted with springs strong enough to release the clutch and bring the two disks back to normal position when the air pressure is released. Thus, the only effort required of the operator is the movement of a valve.

The clutch is especially adapted to fields where clutches of large horsepower are required, or where it is desired to obtain remote control. Only a small amount of air is required for its operation, from 1 to 3 lb. being ample. One pound of air in a 30-in. clutch gives a spreading power of about 1,400 lb. In places where a gas engine is used for power, the exhaust may be utilized to produce the pressure required for clutch operation. Where electric power is used, a small rotary



DICKSON PNEUMATIC CLUTCH

blower can be driven from the quill to furnish the required air.

Having no toggles or levers, the clutch is not affected by centrifugal force. Since it has two opposed driving cones, there is no end thrust on the bearings. A continuous flow of air is allowed to go into the clutch to take care of any leakage that may occur. As the air inlets are small, breakage is not likely to take place because of too sudden engagement. The horsepower increases rapidly with increase in the diameter of the clutch, the 36-in. clutch, being rated at 165 hp. at 100 r.p.m., and using air at a pressure of 3 lb. per square inch.

Landau Sensitive Multiple Drilling and Tapping Machine

The sensitive multiple-spindle drilling and tapping machine shown in Fig. 1 has recently been placed on the market by the Landau Machine and Drill Press Co., 45 West 18th St., New York, N. Y. The machine is of the quick-change type and provides both low and high speeds. By operating the shifting lever, the desired speed can be quickly obtained without jar and while running at full speed. Speeds of 500, 900 and 1,800 r.p.m. are available for drilling. For withdrawing taps, the speeds are 600, 1,000 and 1,800 revolutions per minute.

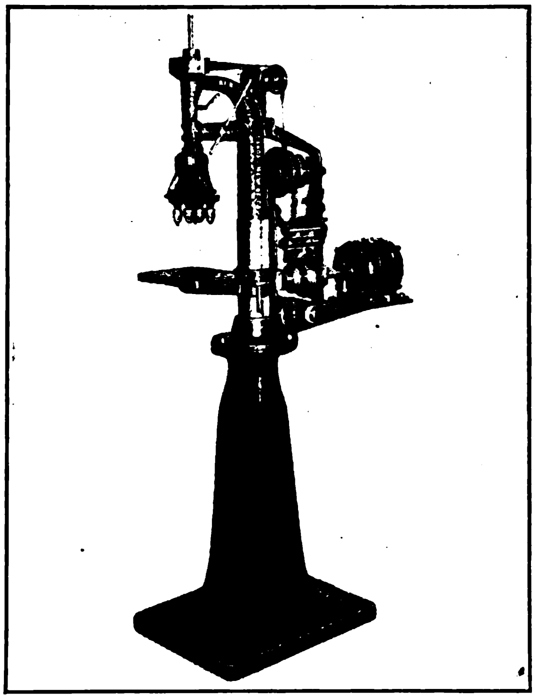


FIG. 1. LANDAU DRILLING AND TAPPING MACHINE

One cone pulley runs in ball bearings on an eccentrically mounted shaft. The slack of the upper belt can be taken up readily by turning this shaft through a portion of a revolution. An idler roller is used to take up the slack of the lower belt when the speed is changed, and it also automatically exerts the proper amount of tension at all loads. The machine can be driven by means of either tight and loose pulleys or a ½-hp. motor. A view of the multiple-spindle head is shown in Fig. 2. The drilling capacity is up to ¼ in., and the tapping capacity No. 10 x 32. The maximum spread of the spindles is 4½ in., and the minmum center distance is ⅞ in. Each spindle can be instantly converted to drilling or tapping without adding or removing any parts. When through drilling, it is only necessary to remove the drill, insert the tap and release a setscrew, and the machine is ready for tapping. Each spindle is a complete unit and may be used individually with the remaining spindles idle. All spindles may, of course, be operated together for multiple drilling or tapping.

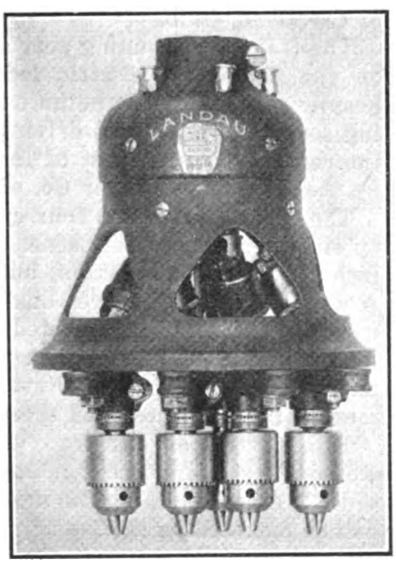


FIG. 2. LANDAU MULTIPLE-SPINDLE HEAD

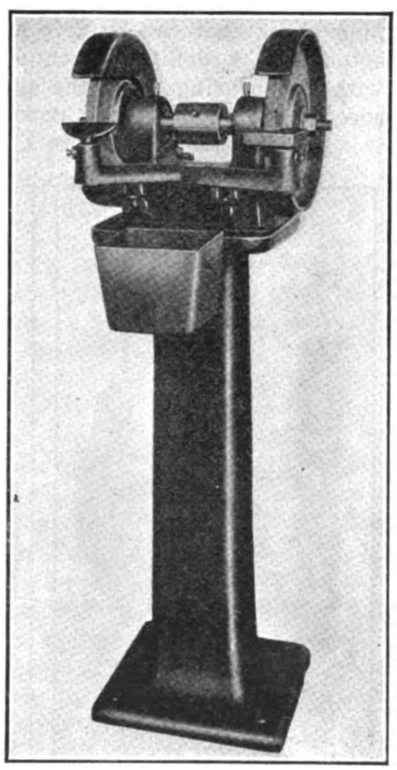
The main drive spindle is centrally located and mounted on ball bearings, which carry the load of the entire head. Each spindle is equipped with upper and lower radial and thrust bearings, and is fully and readily adjustable both radially and vertically. It is but a moment's work to adjust for the shortness of a drill or tap in case of breakage. The spindle arms have triple the strength required to drive the drilling spindles.

The light weight of only 8 lb. makes the head suitable for small work. All operating parts are made of nickel-steel, hardened and ground. The moving mechanism is protected by a ventilated hood which acts as a guard. The feed of the head is operated by means of a rack and pinion, counterbalanced so as to be very sensitive. The head has a travel of 3½ inches.

The table is 10 x 12 in. in size and has a vertical travel of 9 in. The distance from the center of the spindle to the column is 8 in. The height of the machine is 60 in. with the column and 30 in. without it. The floor space required by the motor-driven machine is 20 x 34 in. and by the belt-driven machine 20 x 26 in., the weights being 360 and 300 lb., respectively. It is stated that the machine can produce in eight hours 8,000 holes in a cast-iron plate ½-in. thick.

Fafnir Ball-Bearing Tool Grinder

A ball-bearing tool grinder is a recent development of the Fafnir Bearing Co. of New Britain, Conn. It may be furnished with a bracket to provide the necessary offset where it is desired to bolt the grinder to a post. When it is desired to mount it on a bench, a plate can be provided; or it may be furnished with a pedestal, as shown in the illustration. The chief feature of the grinder is in the method of mounting the spindle, this being accomplished by the use of Fafnir ball bearings. The spindle can be driven by belt direct from the lineshaft, so that it is not necessary to start and stop it each time the grinder is used. Adjustable toolrests, water pot and wheel guards are furnished.



FAFNIR TOOL GRINDER

Landau Plain and Back-Geared Tapping Chucks

The Landau Machine and Drill Press Co., 45 West 18th St., New York, N. Y., has recently placed on the market a line of tapping chucks. At the left of Fig. 1 is shown a simple friction device for holding taps, so as to prevent breakage in case a hard spot is encountered in the work. The device, designated as the Model G, can be used with the Models B and E tapping chucks that will be described later, as well as with standard tapping machines. It is made in two styles, the one shown having a tapered shank, for use on drilling machines and lathes. The other style has a straight shank with a reversing sleeve, so that the device can be used in a turret head.

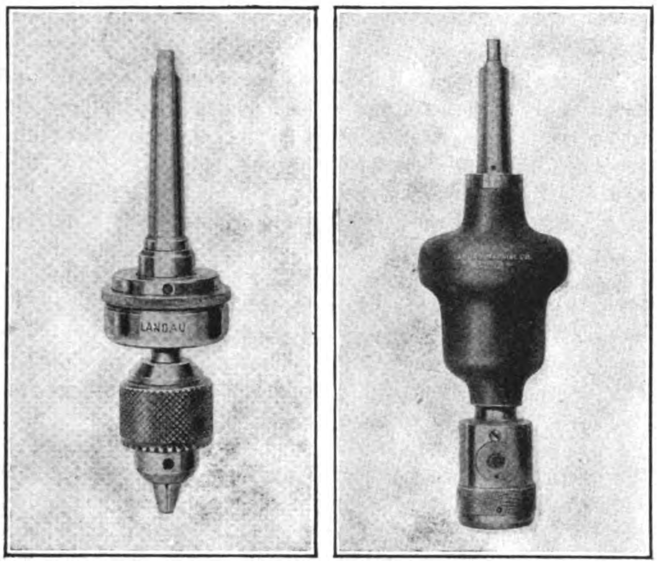


FIG. 1—LANDAU MODEL G (AT LEFT) AND MODEL B (AT RIGHT) TAPPING CHUCKS

At the right of Fig. 1 is shown a single-spindle tapping chuck that can be driven directly from the main spindle of a drilling machine. The device is fitted with ball bearings, and the spindle reverses at higher speed than when feeding downward. The capacity of this Model B chuck is up to $\frac{1}{2}$ inch.

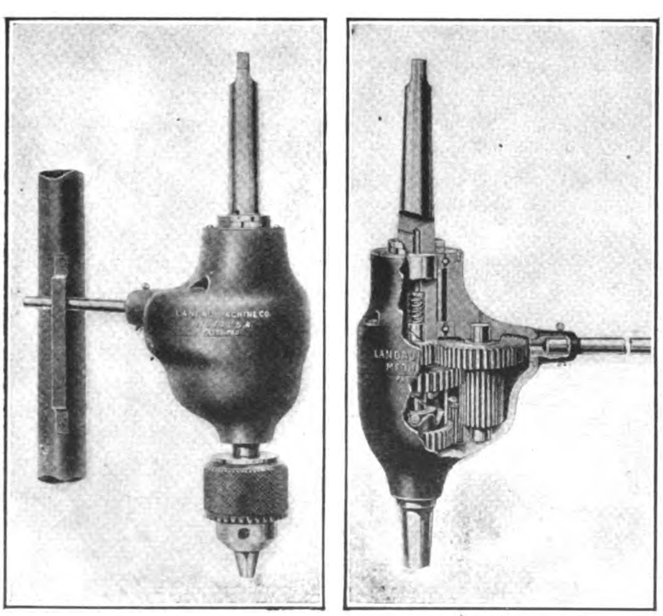


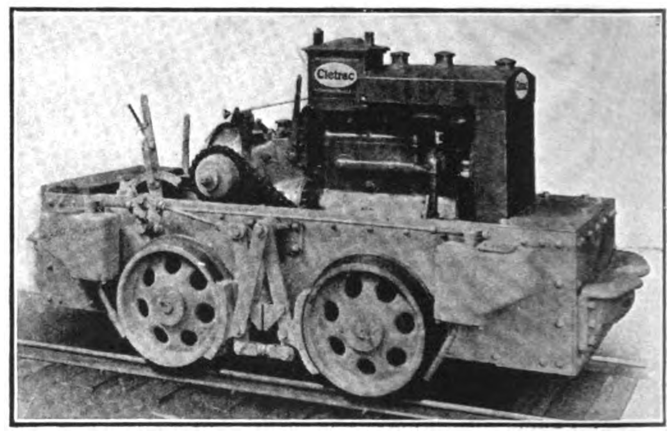
FIG. 2—LANDAU MODEL E BACK-GEARED TAPPING CHUCK

A single-spindle back-geared tapping chuck, known as the Model E, is shown in both external and internal views in Fig. 2. The use of back gears permits of a much higher speed for reversal of the tap than for the forward speed. The arrangement of the clutches can be easily seen. The main drive is fitted with ball bearings, and a standard tap-holding chuck is used. The ratio of the reverse speed to the forward speed is 5 to 1. The chuck holds Nos. 1 and 2 Morse tapers, and it has a capacity up to $\frac{7}{16}$-in. taps. The Model F chuck is similar to the Model E. However, the speed of reversal is three times the forward speed and the capacity is from $\frac{3}{8}$ to $1\frac{1}{8}$ inches.

In the Models E and F chucks, the speed control mechanism and the clutches operate to prevent breakage of the taps in case the movement is hindered by some obstruction in the work. The use of the back gears permits a very small size for the body or housing of the chuck. No screws protrude from the housing, which is perfectly smooth in contour.

Atlas-Cletrac Industrial Locomotive

A light industrial locomotive driven by a gasoline motor and intended for general hauling around industrial plants and for road construction, is shown in the accompanying illustration. It has recently been placed on the market by the Atlas Car & Manufacturing Co. of Cleveland, Ohio.



ATLAS-CLETRAC INDUSTRIAL LOCOMOTIVE

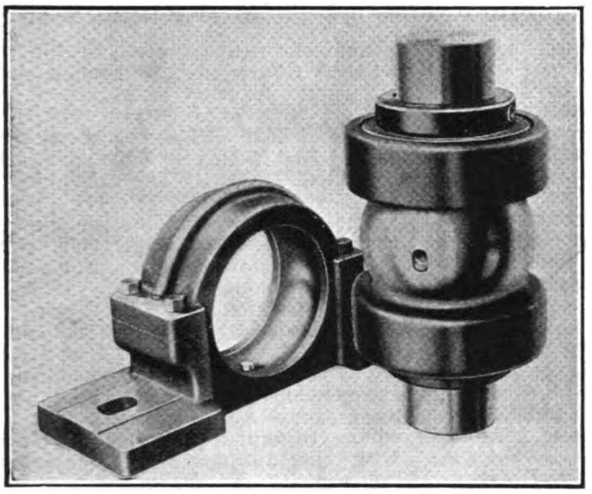
The frame and running gear are similar to those used on the company's electric locomotives and are very heavily made, so that the unit is capable of withstanding severe service. The driving mechanism consists of the complete power plant of the Model F tractor made by the Cleveland Tractor Co. of Cleveland, Ohio.

The 18-hp. motor has four cylinders, and can be run on either gasoline or kerosene. The operating parts are inclosed to give protection, but are readily accessible. A washing device removes dust from the air fed to the motor. The clutch is located in the flywheel of the motor. Both axles are driven from the jackshaft by means of roller chains. Reversal is accomplished by means of a jaw clutch and speed control by the throttle.

Either steel or cast-iron wheels can be furnished. Bumpers, sanders and hand-operated brakes are provided. A cab inclosing the mechanism and the operator can be mounted on the frame. The wheel base is 34 in. and the gage 24 in. or wider. The maximum speed is 8 miles per hour, and the draw-bar pull at 4.8 miles per hour is 800 lb. The tractor weighs about 4,000 lb.

Fafnir Double-Ball-Bearing Self-Aligning Pillow Block

The illustration shows a pillow block that has recently been brought out by the Fafnir Bearing Co. of New Britain, Conn. The essential features of the Fafnir double-ball-bearing hanger box have been adapted to a self-aligning pillow block. The block is



FAFNIR SELF-ALIGNING PILLOW BLOCK

nearly frictionless, since both radial and end-thrust loads are carried by the balls. The block has the minimum distance possible from the base to the shaft center. Although it automatically aligns to compensate for any discrepancy between the bed on which it rests and the position of the shaft, the aligning occurs without affecting the ball bearings, as they are both installed in a box which aligns as a unit.

Each unit contains two Fafnir transmission ball bearings having radial ball contact and deeply grooved races. The inner ring of the bearing is made very wide, in order to give the bearing a firm seat on the shaft and to afford greater support to the shaft. The outer ring of each bearing is mounted against a shoulder near the end of the box. An end cap, held in place by a steel wire which is snapped into a groove machined in the housing, contains a felt washer and prevents the escape of lubricant or the entrance of dirt.

The box contains no bolts, screws nor adjustments. It is secured endwise on the shaft by means of two collars fitted with setscrews. These collars have lugs which engage corresponding slots cut in the wide inner rings of the ball bearing. Consequently, the shaft, collars and inner rings revolve integrally, and the collars drive the inner rings so that they cannot slip and score the shaft.

The pillow block may be easily installed. The base may be bolted to the bed, and the cap secured after the box and the shaft have been fitted in place. When dismounting, the shaft and box may be removed without disturbing the base, or the shaft may be withdrawn merely by loosening the driving collars. The oil cannot leak out of the housing.

The spherical seat in the pillow block and the ball on the box permit the whole box to align as a unit with the shaft. The block is of especial use on large sizes of fans and blowers.

High Production Costs—Discussion

By H. L. Wheeler

In his article entitled "Labor Cost in Building Machine Tools," published on page 438 of American Machinist, Simeon Williams, in taking exception to statements made by Harry Senior on page 305 of the same journal, resorts to vague and somewhat inconsistent explanations that do not explain, in a manner that constitutes rather an approval of Mr. Senior's article than otherwise. The statements above mentioned seem to Mr. Williams to be so at variance with the facts as to require confirmation by first-hand witnesses before he can accept them, yet he would have us believe in refutation of them, statements that are equally vague and that have no more definite backing than those of his opponent.

In a report recently issued by the Committee on Elimination of Waste in Industry, of which Herbert Hoover is chairman, it is stated that the average metal working plant in six representative classes actually engaged in the construction and repair of machinery is about 30 per cent behind the best plant (we may assume the Ford plant) in output per employee. According to this report this class of plants must answer for 28.66 points of waste distributed as follows: Management 23.23; labor 2.55; and outside contracts, which, I presume, includes selling expense, 2.88. It would appear from these figures that management is responsible for 81 per cent of the losses due to nonproduction, labor 9 per cent, and outside contacts 10 per cent.

In comparison with other industries surveyed the metal trades make a very good showing in regard to points of waste as may be seen by the following figures indicating points of waste for the others: Boots and shoes, 40.93; textiles, 49.20; building, 53,00; printing, 57.61; men's clothing, 63.78. On the other hand all these industries make a better showing when it comes to management, their losses in this respect being much less than is found in the metal trades. In any event the report is an indictment of management and many so-called systems of scientific management, and it does not seem to substantiate the statement that "labor costs are the controlling element in every thing we buy."

High rents are often made so by people who want to put on a "front" and trade on credit. High costs of food are often caused by stock jobbers, who regulate the supply but not the demand. In any large city tons of food are allowed to rot in storage rather than place it on the market below a "price."

Labor, it is true, is responsible for many of our present-day embarrassments but I do not think it is by any means the largest item. Labor is not a tangible asset. The manufacturer does not have to invest in labor, so that when labor is idle it does not take anything out of plant investment in the way of interest. Labor saving machines and devices are unquestionably good things if they can be kept going, but when they are idle over prolonged periods they are like a millstone about the neck, or the horse that has to eat whether he works or not. A hundred thousand dollars worth of labor saving machinery lying idle will push a man off Easy Street about as quickly as anything I know of.

News Section

War Department Expenses Cut by Senate

The further manufacture of rifles for the army was opposed by Senator Hitchcock of Nebraska, during debate on the War Department appropriation bill. He took the position that further manufacture of the arm was unnecessary in view of the fact that there are already 2,800,000 rifles on hand. He offered an amendment reducing the appropriation for the manufacture of rifles from $375,000 as proposed by the committee to $75,000, which he said would permit the Springfield, Mass., arsenal, which manufactures the arm, to remain in a stand-by condition. Senator Wadsworth of New York, chairman of the military committee, explained that the committee recommendation covered a minimum production of thirty rifles a day at an expenditure of $900 a day, and that it was desired by this minimum production to preserve the art of making rifles which would be otherwise lost. Senator Hitchcock argued that if the Government would continue to manufacture rifles to continue an art there was sufficient reason for continuing the manufacture of chemicals for chemical warfare, and other implements of war. He denied that the art of making rifles would be lost if production was now stopped. Senator Lodge, Mass., opposed curtailment of the appropriation. The Hitchcock amendment was defeated by a vote of 18 to 47.

Appropriations for the ordnance service of the Army are cut by $1,102,060 from allowances made by the House, by the Senate appropriations committee in reporting the War Department appropriation bill. The appropriations for various purposes are reduced by the following amounts: Ordnance stores, ammunition $258,500; manufacture of arms, $25,000; purchase, manufacture and test of tanks, $100,000; mountain, field and siege cannon, $250,000; ammunition for mountain cannon, $100,000; amunition for subcaliber guns, $10,000; repairs of arsenals, $205,000; civilian ordnance schools, $17,000; seacoast cannon, $50,000; ammunition for seacoast cannon, $50,000; ammunition for subcaliber guns for seacoast defense, $10,000; seacoast cannon insular possessions, $25,000.

Further Work on Screw Threads

Screw thread matters will be considered at three meetings which are being planned for the end of June. The exact date has not been set at the time of this writing. One of the meetings will be that of the National Screw Thread Commission. The sectional committee on general engineering work plans to meet immediately following the meeting of the Commission. The sectional committee on standardization and unification of screw threads also expects to meet at about the same time.

Tariff on Machine Tools Probably to Remain at 15 per Cent

In considering tariff rates for printing presses, the senate on June 8 voted to retain the present rate of 15 per cent ad valorem, foreign valuation plan, rather than adopt the committee rate of 35 per cent. The vote was close, the committee rate being rejected by 28 to 27. The argument used against the rate of 35 per cent was that importations of printing presses are insufficient to justify it.

Machine tools and parts of machine tools, being covered in the same paragraph of the tax bill, will take the same rate. The decision must be considered in detail, after the Senate finishes with the bill, by the committee of conferees composed of three members of the ways and means committee of the House and three members of the finance committee of the Senate. Congress must after that approve the committee agreements. The probabilities are that the 15 per cent rate will stand unless machine tool manufacturers are willing to protest and able to show that importation of machine tools is, or is likely to be, heavy enough to justify a higher rate.

Cash registers, now on the free list, were made dutiable at 25 per cent ad valorem foreign valuation plan. Rates were provided of 25 per cent for cream separators, 50 per cent for knitting, braiding and insulating machines and all other textile machinery, 30 per cent on embroidery machines, including shuttles for sewing and embroidery machines, lace making machines, and machines for making lace curtains, nets and netting.

Belgian Industries Favor Standards

Great progress in standardization, particularly in the construction, metal, mining and electrical industries of Belgium are indicated in a report from the Association Belge de Standardization, which has just been received by the American Engineering Standards Committee. The report shows, among other things, that the Belgian manufacturers have established standards in the following lines: Steel fabrication, steel bridges, shafts and pulleys, bolts and rivets, electrical machinery, and galvanized and corrugated iron and partitions. These standards have all been printed, and copies are available through the American committee. Steps are now being taken in Belgium for establishing standards of rules for the design and inspection of reinforced concrete structures, chains, wire cables for cranes, hoists, elevators and mining purposes. A technical committee is now arranging work to be taken up to establish standards on cast-iron pipes and fittings, and rules for the design of shafting.

Durant Buys Willys Property at Auction

Subject to confirmation by the U. S. District Court, the great plant of the Willys Corporation at Elizabeth, New Jersey, built at a cost of $10,379,416 was sold last Friday at a receivers' sale to Jos. P. Day of New York, acting for W. C. Durant. The sale price was $5,525,000.

The other two bidders on the property were J. Clarence Davies, a New York real estate operator, and Senator James Smith, of New Jersey, acting for Arthur Golston of New York. Mr. Davies refused to divulge the names of his clients.

The sale created a wide-spread interest, evidenced by an attendance of more than 1,000 persons, many of whom are figures prominently identified with the automotive and machinery industries.

Under the terms and conditions governing the sale, laid down by the court, the entire property was divided into four chief subdivisions or parcels. The machine tools and machinery covered in a special catalog, made up a fifth division and these were divided into twenty-three separate lots. These parcels were first offered for sale separately before offering the entire property as a complete unit. Under the terms, announced at the opening of the sale, the total of the individual bids had to exceed the bid for the property as a complete unit, otherwise the individual bids were to be rejected and any deposit already made was to be returned.

The bids on the twenty-three lots of machinery and machine tools aggregated $231,650. On offering the twenty-three lots as a complete unit, the machinery was finally sold to Jos. P. Day, for Mr. Durant, for the sum of $375,000. This brought the total individual bids for the four parcels and the machinery up to $3,030,000 and it was at this figure that the spirited bidding started for the property as a whole.

J. Clarence Davies bidding against Senator Smith with an occasional bid from Mr. Day carried the price to $5,000,000, at which point he retired, and the property was sold finally to Mr. Day for the price already stated.

Mr. Durant, promising a complete announcement of his plans upon confirmation of the sale by the court, stated that the plant would be used to produce the new Star car at the rate of about 500 a day.

British Auto Exports Drop One-Half

Exports of British made motor vehicles and parts during the first three months of 1922 show a decrease of more than 50 per cent, as compared with the exports during the same period of last year, and about 30 per cent as compared with the same period for 1920.

American Foundrymen's Association Discusses Technical Subjects

The best attended and most successful convention yet held by the American Foundrymen's Association took place from June 5 to 9 at the Exposition Park in Rochester, N. Y. The meeting was held in conjunction with the Institute of Metals Division of the American Institute of Mining Engineers.

Technical sessions and entertainment features took place each day, and an exhibit of equipment and supplies was carried on during the entire convention. Over 175 concerns representing all branches of the industry exhibited products, and the completeness of the exposition contributed greatly to the success of the meeting. Since foundry appliances of all sizes and types were exhibited, the industry showed the trend of development in foundry practice and equipment.

After registration on the first day, a joint session of the two societies was held. On Tuesday morning a number of papers on metallography were presented at a session held by the Institute of Metals Division.

One of the high spots of the convention was the International Session that also took place on Tuesday morning. According to an arrangement recently entered into with three European associations of foundrymen, exchange papers were presented by J. Leonard, president of the Association Technique de Fonderie de Liege of Belgium, by the Association Technique de Fonderie de France and by F. J. Cook of the Institution of British Foundrymen. Great interest was shown in the papers, particularly the last one on "American vs. British Cast Iron." It was evident that the exchanging of ideas between the various associations greatly promotes interest in the work done abroad and fosters friendship and co-operation.

On Tuesday afternoon simultaneous sessions were conducted on steel and on non-ferrous metals. Separate sessions on steel, gray iron and aluminum were held simultaneously on Wednesday morning, while in the afternoon the meetings were devoted to discussing practice in the brass foundry and the problems of industrial relations. At the latter session a report was made by a special committee on Safety, Sanitation and Fire Prevention. Ernest F. DuBrul, general manager of the National Machine Tool Builders' Association, spoke on "Cycles of Depression and Their Prevention." L. W. Wallace, executive secretary of the Federated American Engineering Societies, discussed the "Prevention of Waste in Industry."

At the banquet on Wednesday evening, held at the Powers Hotel, Governor Henry J. Allen, of Kansas, was the main speaker. The governor delivered his usual spirited address on industrial relations.

Research work on molding sand was reviewed on Thursday. The meeting was particularly important because a report on molding sand research was presented by the joint committee of the American Foundrymen's Association and the National Research Council. On Friday, the last day, the time was devoted to a malleable iron session and a general business session.

Federal Commission Hits Steel Merger

Following the request expressed in Resolution No. 286 agreed on May 12 by the United States Senate, the Federal Trade Commission has formulated a report which has been forwarded to the President. The resolution requested that the commission, and also the Attorney-General, inform the Senate what steps have been taken, or were proposed, to ascertain the purpose and probable effects of the proposed merger of certain steel companies which were named in the resolution. The commission was also asked to state the results of any investigation which it may have conducted and what action it has instituted to protect the public interest.

The matter in question was the proposed merger of several of the more important steel companies of the country, a matter which has been given wide publicity in the daily press during the past month. Regarding the proposed combination of the Bethlehem Steel Corporation and its subsidiaries with the Lackawanna Steel Company and its subsidiaries, the commission reported as follows: "That the proposed Bethlehem-Lackawanna merger when consummated would constitute an unfair method of competition in that it contains a dangerous tendency unduly to injure competition and to restrain trade and commerce and that a proceeding by the commission in this respect is in the public interest." In accordance with this finding the commission on June 3 filed a complaint against the merger.

As regards the merger of the Midvale Steel and Ordnance Co., the Republic Iron and Steel Co. and the Inland Steel Co., these companies proposing to form a new corporation to be shown as the North American Steel Co., the commission reported that the plans for this merger have not progressed far enough for the commission to determine whether the combination would be a direct violation of laws governing the restraint of trade or interstate commerce. The details of this plan are, however, being carefully followed and as soon as the commission is in possession of sufficient information, it will make a further report to the senate.

Hundred Million Business in 1921

The sales of the Westinghouse Electric and Manufacturing Co. during 1921 amounted to almost $100,000,000, as shown by the annual report of the company dated March 31, 1922. This is the largest volume of business handled by this company, except during the three abnormally active years before the war. Manufacturing costs were higher, however, as these could not be reduced as rapidly as prices fell. Furthermore, the expense of development work and about one and a half million dollars for depreciation of inventory were charged against manufacturing costs, so that the increase in surplus was only slightly greater than the amount paid out in dividends. The report states that the current assets of the company are $41,700,000, while its current liabilities are only $11,400,000. In addition, the company shows an inventory of $55,000,000.

Cleveland Drill Co. Scores High Tariff on Raw Materials

In a recent debate on the tariff question before the Tariff Committee, Senator Fletcher called the attention of that body to two letters pertaining to steel duty, and, at his request, they were printed as part of the records of the debate. One of the letters, coming from the Cleveland Twist Drill Co., of Cleveland, Ohio, declared that the economic unsoundness of a high raw-material duty versus a low finished-product duty should be pointed out to those who will be responsible for safeguarding the livlihood of American workmen in the basic and highly technical industry of tool production. The letter presented a comparison of American wage rates and tariff rates with those of foreign countries, and endeavored to show the detrimental effect a high raw-material duty will have on the production of American steel tools. The letter declares that the high-speed steel manufacturing interests will undoubtedly take advantage of the high duty on their products to raise the price of high-speed steel to their customers. Foreign small tools similar to those manufactured by the Cleveland company will pay a duty that will be less than two-thirds of the duty on the raw steel itself.

These tools, which can be made in Germany and England by labor receiving a lower scale of wages than American labor, lets them enjoy a double advantage over American made tools. A tariff which places higher duty on tungsten and tungsten steel than on finished tools containing tungsten will injure the producers of these products, as well as the industries which use materials containing tungsten. The low-priced tools as sold in the American market will deprive American steel makers of just that much of their market for the steel which they manufacture.

Another letter from the Poldi Steel Corporation of America protests vigorously against what is called the destruction of our business, particularly in view of the fact that our Government will not benefit from the standpoint of revenue, but, indeed, will lose the substantial revenue now obtaining. The letter declares that with the passage of the bill with respect to the tariff on fine steel, a substantial revenue now accruing to the Government will be cut off.

During the course of the debate, Senator Underwood remarked that the rates, even as reduced by the Tariff Committee, are still higher than those in the existing law. He said that there is no justification for a higher rate, and that an amendment providing for a reduction will be presented at the proper time.

What to Make in Prisons

The House has passed a resolution for an investigation and report by next December by three members each of the House and Senate Judiciary Committees, of articles desirable to be manufactured by prisoners at U. S. penitentiaries at Leavenworth, Kans., and McNeil Island, Wash., including an estimate of the cost of machinery necessary therefor.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

The continued strength of sterling exchange, which carried bills on London to 4.51¼ last Tuesday was the most important development of last week in its bearing on international affairs. It brings the vast British Empire appreciably nearer specie payment and the financial stability that is essential to the normal development of the world's trade. It is due partly to government buying in preparation for the £25,000,000 interest payment which Great Britain will make this fall on her debt to the United States Government, but it also connotes English confidence in the ultimate arrangement of a loan to Germany which was disappointed because of the unwillingness of France to agree to the reduction in the reparation payments to be made her as stipulated by the bankers.

Although it is believed that the logic of events as reflected in Europe's need of credit will in time reopen the *impasse* thus created, the immediate effect has been a further depreciation of the German mark to 33⅜ cents a hundred. The decline was perhaps accelerated by the German Bank statement of May 31 which shows that 151,949,179,000 paper marks were then outstanding as compared with 142,903,593,000 on May 15.

Deflation or Debacle

In some quarters it was inferred from these figures that Germany was afraid to check inflation and would continue to print paper money as long as it would buy anything. But this view is not reasonable. Deflation or a debacle is inevitable in Germany. The former with a loan will be far less ruinous than the latter, and there is no doubt that the less distressing alternative will be accepted, even though France may for a time protest against abating claims no part of which she can collect unless it is made possible for Germany to borrow. The adjournment of the bankers' committee may be in part a strategic move to force France to terms.

It is not therefore unintelligent to expect that marks will advance in value as the facts become understood. Incidentally it is in order to point out that 152 billion marks at 33⅜ cents a hundred are worth considerably less than 143 billion at 38 cents.

The only other important news from abroad is the admission of Lenin's serious illness. It is important because his death or incapacity would probably loosen the grip of the Soviet government in Russia and hasten the complete political reorganization of Europe.

The more significant foreign developments are thus stressed because despite our boasted isolation we are still susceptible to influences which might disturb our foreign trade and it is highly desirable that we should see the facts in their true relation.

Of our domestic situation it is still possible to speak with conservative optimism. Perhaps the most encouraging item of a statistical character published during the week was the news of an increase of 15 per cent over last year in the postal receipts during May. Now that the carriage of parcels is such an important part of the post office business the revenue derived from it is a particularly good reflex of general conditions.

Considered in detail there are only two dark spots in the economic map of the country. One is the coal strike. The other is the low price of wheat. They are both important though the fact that they are so lightly considered attests the widespread and confident cheerfulness of the nation. It is true that a dollar for wheat used to be regarded as a fair price, but that figure is out of line with the present wage scale and the value of most other staple commodities. As to the coal strike Mr. Hoover is still laboring with it but an agreement between the miners and the operators seems no nearer and if after the first of July the mines are still idle there will be genuine reason for concern.

Railroad earnings and traffic are surprisingly good. The Labor Board has decreed another reduction, estimated at $60,000,000 annually, in the pay of the shopmen, and another strike vote is being taken, but good judges say the men will accept the cut and this seems probable. The New England textile strike is approaching its end. The mill owners have won and operators are slowly returning to work but with bitterness in their hearts that bodes ill for the future of the cotton industry in the North. The dry goods trade continues to improve. It might now be called excellent.

Commodity Markets Firm

The cotton market goes up and down as the rain falls or the sun shines. An accurate weather prophet could make a fortune as prices fluctuate between 20 and 21 cents, which will probably be the range until public opinion in regard to the size of the crop has crystallized.

A sharp advance in sugar has justified the views previously expressed in this letter. Refined has been advanced to six cents and Cuban raw has sold at three cents cost and freight, ex duty. If refined should go to seven cents, as seems possible, the raw parity would be about four cents. These figures are not by any means improbable in view of the enormous demand, the reduction in the European production of beet sugar and the rapid distribution of a supply that was considered burdensome only four months ago.

The steel mills are busier. Iron is up. Building continues active notwithstanding the increased cost of brick and lumber. Silk is firm. Rubber is unchanged. The automobile manufacturers say that they will be running at capacity through July, and May production was the largest in our history. Copper hesitates around fourteen cents but at this figure it is moving freely. The stock market is erratic but in the main firm, though prices are not much higher. The steel mergers are held up pending an investigation by the Federal Trade Commission whose ultimate approval is expected upon the theory that the present administration is not unsympathetic with big business. Several new bond issues, including one of $6,000,000 for the city of Montevideo in Uruguay, and another of $7,500,000 for the city of Greater Prague, now the capital of Czecho-Slovakia, were successfully disposed of.

The constant absorption of these foreign obligations and the advance in sterling must in time lead to the loss of some of our gold. This we can well afford for we have too much, but when the outward movement commences the markets will be sensitive to its continuance and the weekly statement of the Federal Reserve System should therefore be closely watched. The figures published last Friday morning show a decline in the reserve ratio from 78.0 to 77.6 per cent, an expansion of $2,500,000 in the gold reserve, and an increase of $40,000,000 in member banks' deposits.

These changes are not significant and there is nothing in the outlook that gives cause for uneasiness or reason to doubt that we shall have fair weather and a high barometer at least until after the election.

Safety Institute Reinstates Seaman Medal for Health Service

The Safety Institute of America has announced that the Louis Livingston Seaman gold medal is to be awarded this year for progress and achievement in the promotion of hygiene and in the mitigation of occupational disease. This medal was first given in 1911, but for the last three years war conditions have prevented the Institute from making the award. Former Surgeon-General Gorgas received the Seaman Medal in 1914 in recognition of his winning fight against the disease-carrying mosquito in Panama. Other recipients have been Dr. Alva H. Doty, former Health Commissioner of the Port of New York for efficient work in protecting the city from foreign invasions of disease; the United States Steel Corporation and the National Cash Register Co. for their pioneer work in the field of employee welfare; William A. Fairburn for the protection of workers in the match industry against phosphorous poisoning; and to the Julius King Optical Co., of New York, for scientific research and practical achievement in overcoming the harmful effects of light to the eyes of arc welders. The most recent award was to Arthur H. Young, Chief Sanitary Expert for the Federal Government during the World War.

Plans for National Transportation Institute

Organization in the near future of a National Transportation Institute is practically assured. While no date has been set for the organization meeting, it will be held before the end of the summer. Bird M. Robinson, the president of the American Short Line Railroad Association, and his associates, who are doing the active work of promotion, are engaged at present in lining up such support as will insure the new organization of representative backing.

The organization of such a national association is being urged by Representative Sidney Anderson and his associates on the joint commission of agricultural inquiry set up by Congress. Formal action endorsing the Institute already has been taken by the following organizations: American Farm Bureau Federation, National Agricultural Conference, American Lumber Congress, National Association of Manufacturers, Joint Commission on Agricultural Inquiry, and the American Short Line Railroad Association.

The Institute is to have its headquarters in Washington "under the supervision and control of men of preeminent ability, standing and learning, with reference to transportation." The organization will attempt to acquaint the public with:

1. The true fundamental principles underlying the various kinds of transportation facilities.
2. The facts as to the present conditions affecting transportation and the relative necessity and important of each class of common carrier.
3. The real effect of each type of legislation and regulation.
4. How and to what extent, the public and the carriers will be benefited, or affected adversely, by any policy or course of action that may be adopted in respect to their transportation problems.

Bosch Branch Managers' Conference

A three-day conference of the branch managers of the American Bosch Magneto Corporation was held on June 1, 2 and 3 at the corporation's plant at Springfield, Mass. The branch managers attending this conference were Charles Shedd, of Detroit; George Shortmeier, of New York; A. K. Chamber, of Chicago, and T. C. Miller, of San Francisco, with their assistants. These men were summoned to confer with the executives of the corporation at Springfield for a discussion of business conditions and plans which should be followed in carrying on the sales and service activities in the field.

A. H. Bartsch, general sales manager, states that the rapidly changing business conditions of the present year do not warrant a fixed and firm sales policy. He believes a more liquid policy is necessary, in order to take full advantage of the changing conditions.

In criticising the spread between the labor cost and duties in the tariff bill Senator Simmons, N. C., said that in the case of electrical machinery, apparatus and supplies, the labor cost is 23.9 per cent while the duties in the bill are 40 per cent.

Bulletin on Prevention of Blindness

The National Committee for the Prevention of Blindness, whose headquarters are in the Russell Sage Foundation Building, New York City, has issued a revised edition of its Bulletin No. 12. This bulletin was originally issued in 1917 and has been out of print since the latter part of 1921. It will combine one complete volume of practically all the available information on the subject of blindness. The committee has been aided in its work of revising the bulletin by the Safety Institute of America, the National Safety Council, the American Society of Safety Engineers and several specialists in this line.

The regulations of the recently developed safety code for the protection of the heads and eyes of industrial workers, adopted by the United States Bureau of Standards and approved by the American Engineering Standards Committee, will be included in this revised bulletin. The publication will be prepared with a view to its distribution among heads of departments of industrial plants, engineering colleges, technical schools and to others interested in the prevention of blindness among industrial workers. It is expected that the bulletin will be ready by the fall.

Business Items

The Dail Steel Products Co., 8751 Grand River Ave., Detroit, Mich., has contracted with the Packard Motor Co., Detroit, for the entire output of its metal-stamping department, and operations will be carried on exclusively for this company for some time to come. Daily shipments will be made by motor truck to the Packard plant.

C. L. Amos, of the C. L. Amos Coal Co., 200 East Genesee St., Syracuse, N. Y., and associates, have formed the Electdrive Co., with capital of $50,000, to manufacture motors, engines and kindred products. Other officials include E. M. Larkin and F. B. Conway, both of Syracuse.

The Fisher Body Corporation, General Motors Building, Detroit, Mich., has acquired the former plant of the Cadillac Motor Car Co., Cass Ave., comprising about 650,000 sq.ft. of floor space. The factory will be used for the manufacture of special automobile bodies, and will give employment to about 2,000 operatives.

The Franklin Automobile Co., Syracuse, N. Y., has awarded prizes to 226 employees for contributions submitted in the second "Suggestion Contest" conducted at the plant. The prizes ranged from three first awards of $400 each, one of $300, three of $200, two of $100, five of $50, and the remainder, $25 each. The prizes were given for: (1) Best suggestions for improvement in the Franklin car; and (2) best suggestions for reducing the cost of production, without in any way impairing the quality of the car.

The Monmouth Plow Factory, Inc., Monmouth, Ill., manufacturer of agricultural machinery, has arranged for a change of company name to the Brown-Lynch-Scott Co.

The Bridgeport Machine Co., Bridgeport, Conn., which recently purchased the plant of the Jones Automobile Co., at Wichita, Kansas, has moved its Bridgeport offices and shop from North Main St. to North Boston St. The plant of the same company at Marietta, Ohio, will also be removed to Wichita as soon as arrangements are completed.

The Firth-Sterling Steel Co., of McKeesport, Pa., has opened a western office at 336 East 3d St., Los Angeles, Calif. This office will be in charge of William E. Nelson, who has been engaged in marketing Firth-Sterling steel for twenty years. Mr. Nelson will be assisted by F. J. Kuhlmann, L. W. Mead, T. D. Moore.

The Pittsburgh Testing Laboratory has opened a sales office, with a complete inspection bureau, at 1864 Railway Exchange Bldg., St. Louis, Mo. Colonel N. C. Hoyles has been appointed district manager. Colonel Hoyles was formerly manager of the Cincinnati branch of the same company.

The Henrici Laundry Machinery Co., Dorchester, Boston, Mass., has recently incorporated the business with a capital stock of $165,000. The incorporators of the company are William P. Everts, 42 Crafts Road, Brookline, Mass.; Thomas W. Morris and Bertha A. McCarthy, Boston, Mass.

The Eastern Shear Co., manufacturer of scissors and shears, New Haven, Conn., recently voted to dissolve the company, and a preliminary certificate of dissolution has been filed with the Secretary of State of Connecticut. All claims are to be sent to L. M. Molloy, Grant street, New Haven.

The Ingersoll-Rand Co. has moved its Dallas, Texas, office from Main St. to the Magnolia Building.

The Atlantic Foundry Co., Akron, Ohio, has announced a decrease in its capital stock from $1,000,000 to $985,-300

The plant of the Sandusky Foundry and Machine Co, Sandusky, Ohio, was recently damaged by fire to the extent of $10,000.

The Lomar Manufacturing Co., Middletown, Ohio, has elected the following officers: C. W. Shartle, Jr., president and general manager; Thomas Randolph, vice-president; L. L. Lomar, general superintendent.

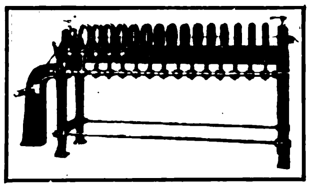
Judge Morton of the United States District Court on June 5, appointed as receivers for the Harley Co., producers of drop forgings and castings in Springfield, Mass., Samuel M. Green, engineer, and George A. Bacon, attorney, both of Springfield. This action followed the petitioning of the concern into bankruptcy. A previous petition for a receivership filed by a stockholder was denied on legal grounds.

The Hendee Manufacturing Co., former owner and now mortgagee of the Harley Co., is restrained by the court from selling the Harley plant by foreclosure, pending an investigation by the receivers. The plant was sold to A. W. Morris and others about six months ago, and the new owners are said to be in default and steps were resorted to for the purpose of preventing foreclosure until a financial dispute between the two companies could be settled. The plant was sold for about $1,000,000 and a mortgage given to the Hendee Co. for $725,000. The receivers furnished bonds of $10,000 each and will enter at once on an investigation of the case.

Condensed-Clipping Index of Equipment

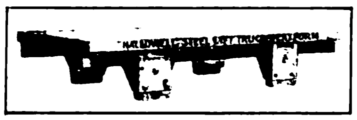
Patented Aug. 20, 1918

Filing Machine, Strip-Metal
Duston & Clark Engineering Co., Inc., Cleveland, Ohio
"American Machinist," March 16, 1922



The machine is used for filing the edges of strip metal to special shape and is especially adaptable to cold rolling mills. It is equipped with fifteen pairs of semi-circular heads carrying adjustable files. All the heads at the front can be operated by a lever so as to pull them forward and open the filing space. The strip metal may be of any gage and up to 3 in. in width. The end of the coil of metal on the spindle spool is passed between the two clamps at each end of the table, and then gripped and wound on a power-driven spool. Weight 1,000 pounds.

Platform, Lift-Truck, Steel, "Hallowell"
Standard Pressed Steel Co., Jenkintown, Pa.
"American Machinist," March 16, 1922

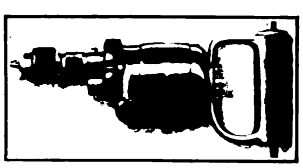


The device is made of steel and wood. The runners at each side consist of steel angles, the ends of which are bent outward. The truck slides easily between the runners. The top of the platform is made of wooden planks bolted to the runners. Steel sockets are riveted to the runners for holding the legs, which are wooden blocks inserted in the sockets and bolted in place. Blocks of different lengths can be furnished to suit the type of truck employed.

Hoist, Portable
Manley Manufacturing Co., York, Pa.
"American Machinist," March 16, 1922

The hoist is primarily for garage use. It has two chains, each operating independently, mounted on sliding drums on the horizontal hexagon shaft at the top of the frame. The shaft is turned by a crank operating through a chain and spur gears. Two speed ratios are provided. The leverage with auxiliary pulleys is 400 to 1, and without them 200 to 1. Capacity, 4,000 lb. Width, 8 ft. Height, 7 ft. 9 in. Weight, 450 lb. A larger size having a capacity of 8,000 lb. is made. Width, 9 ft. Height, 9 ft. Weight, 1,000 pounds.

Drill, Electric, Portable, "Jones"
Consolidated Instrument Co. of America, Inc., New York, N. Y.
"American Machinist," March 16, 1922

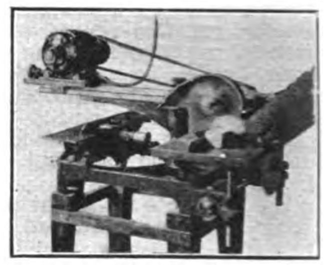


The device is used in general light work and has capacity for driving a ¼-in. twist drill. It is equipped with a universal high-speed motor operating on direct or alternating current of 25 to 60 cycles. The gears are made of heat-treated tool steel, and have helical teeth. The spindle carries a No. 1 Jacobs chuck, and its end thrust is taken on ball bearings. Plug and switch are furnished, with 10 ft. of electric cord. Length, 10 in. Weight, 4 pounds.

Press, Armature, No. 0, "Perfection"
Naperville Machine Co., Inc., Naperville, Ill.
"American Machinist," March 16, 1922

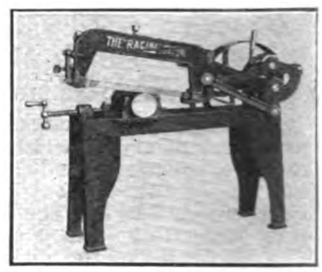
The press is for use chiefly by electrical repair men, but it can be employed also for assembling operations on piston bushings, spindle bushings, gears and similar work. The cast-steel frame can withstand a pressure of 3,000 lb. on the work. A hardened steel plate having three sizes of openings is furnished to accommodate small work. Its two halves can be slipped together underneath the bearings on an armature shaft so that the shaft can be pressed out of the bearing. Height, 17 in. Opening in base, 5 in. in diameter.

Woodworking Machine, Portable, Universal
Hutchinson Manufacturing Co., Norristown, Pa.
"American Machinist," March 16, 1922



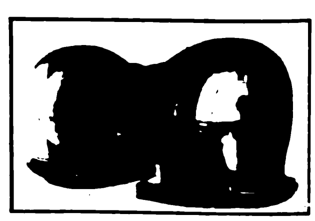
The machine, for mounting on a bench or stand, is adapted to a variety of woodworking operations. It carries an 8-in. cross-cut saw, an 8-in. rip saw, jointer, boring and mortising attachments, a miter board that can be set at any angle and other devices. It is operated by a ¼-hp. motor driven on either d.c. or a.c. and mounted on a swiveling slide. Speeds: saws, 4,200 r.p.m.; jointer, 4,800 r.p.m. Capacity, hard wood up to 2 in. in thickness. Bench space, 18 x 24 in. Weight, 240 pounds.

Cutting Machine, Metal, High-Speed, Junior
Racine Tool and Machine Co., Racine, Wis.
"American Machinist," March 16, 1922



The saw runs at a speed of from 60 to 100 strokes per minute, with strokes 6 in. in length. Blades of 21-gage steel from 10 to 12 in. long are used. There is a positive mechanical lift on the non-cutting stroke, and the cut is taken on the draw stroke. Pressure is applied to the saw blades by gravity. An automatic knock-out stops the saw when the cut is finished. Capacity, 4 x 4 in.; with adjustment, 6 x 6 in. Height, 20 in. Floor space, 38 x 12 in. Weight, 150 pounds.

Grinder, Bench, Electric, Exhausting
Forbes & Myers, Worcester, Mass.
"American Machinist," March 16, 1922



Outside the bearings of the machine are located centrifugal fans which blow the dust directly back through the exhaust pipe connected at the rear of the grinder. The fan does not have sufficient power to carry the dust through long pipes. The inclosed motor of the induction type is made for single-, two- or three-phase alternating current, and in ½ and ¾-hp. sizes. The wheels are guarded. Adjustable toolrests can be located at both ends.

Clip, paste on 3 x 5-in. cards and file as desired

Personals

CHARLES L. WARNER recently resigned as construction superintendent for the Taft-Pierce Mfg. Co., manufacturer of special machinery, Woonsocket, R. I.

G. C. SHIDLE, formerly Pittsburgh manager of the La Belle Iron Works, of Steubenville, Ohio, has become sales manager of the iron and steel department of the Thomas R. Heyward Co. His offices will be in the Bowman Building, Pittsburgh. Mr. Shidle succeeds William M. Orr.

GEORGE W. SCOTT has joined the sales force of the Sheet Metal Manufacturing Co. at Youngstown, Ohio. He was formerly a division manager of the United Alloy Steel Corporation.

H. B. HINMAN, formerly in the sales department of the Stanley Works, New Britain, Conn., has resigned. He will become superintendent of the Trumbull Steel Co., Warren, Ohio.

WILLIAM H. EAGER has assumed the presidency of the Whitman & Barnes Co., Akron, Ohio. He succeeds A. D. Armitage who resigned to devote his entire time to the business of the J. H. Williams Co. of Brooklyn, N. Y., of which he is president.

E. H. SPRINGFORD, assistant to the president of the Goodyear Tire and Rubber Co., of Akron, Ohio, has resigned that position to become president of the Steel and Tube Co., Chicago.

HENRY W. BALSIGER, of the Yale and Towne Mfg. Co., Stamford, Conn., has been appointed to succeed W. W. Brasier, to take charge of the California sales department of the company, with headquarters in San Francisco. Mr. Balsiger was formerly of the Chicago office of the company.

SYDNEY R. MASON, secretary of the Whitin Machine Works, manufacturer of textile and cotton machinery, etc., Whitinsville, Mass., who has been in Japan and the Orient for the past several months, is expected home about the middle of June. Mr. Mason arrived in San Francisco on June 3rd.

RALPH TEMPLETON, for several years manager of the Whitman & Barnes Manufacturing Company's New York office and store, will assume an important position in the company's executive offices in Akron July 1. Mr. Templeton entered the employ of the Whitman & Barnes organization in 1898 and has served it in various capacities continuously since that time. After serving in the Akron office and as Detroit representative he was appointed manager of the New York store in 1910.

W. E. WHITING, formerly connected with the Heald Machine Co. and with the Norton Company, is now connected with the Greenfield Tap and Die Corporation, Greenfield, Mass. Mr. Whiting will be attached to the Detroit office at 75 Congress St., and will represent the machine tool division of the company, specializing on the "Hydroil" internal grinder recently put on the market by that concern.

MELVILLE D. JOHNSON has been selected president of the Syracuse University branch of the American Society of Mechanical Engineers.

W. F. KENTER, works engineer of the Power Specialty Co., New York, has resigned that position and will take up sales work as an independent.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A mercantile firm in Spain desires to purchase faucets for water and steam, domestic and irrigation pumps; machinery for the manufacture of designs made from brass, iron, and other metals; casting machines for iron, copper, etc.; and graphite molds for casting metals. Quotations should be given c. i. f. Spanish ports. Reference No. 2354.

Firm in Spain wishes to purchase hardware, iron and steel products and tools of all kinds. Quotations desired, c. i. f. Spanish port. Correspondence, Spanish or French. Reference No. 2370.

Firm in Italy desires to be placed in touch with exporters of iron, metal, machinery, and tools. Reference No. 2374.

An importing firm in Spain wishes to purchase aluminum sheets for automobile bodies and machinery for working said metal, and electric ovens for varnishing and enameling automobiles. Quotations should be given c. i. f. Spanish port. Terms: Cash against documents or letter of credit. Reference No. 2312.

Automobile supply dealers in Norway desire to purchase and secure an agency for the sale of piston rings (lock joint and step joint). Quotations should be given c. i. f. Norwegian port. Payment to be made through banks in Norway and New York. Reference No. 2361.

Book Reviews

World Metric Standardization: An Urgent Issue. Compiled by Aubrey Drury in collaboration with other members of the World Metric Standardization Council. Five hundred thirteen 6 x 9-in. pages, cloth boards. Published by the World Metric Standardization Council, 681 Market St., San Francisco, Calif. Price $5.

Reviewed by
VERNE L. HAVENS
Editor, *Ingenieria Internacional*

The organization known as "World Metric Standardization Council" is purely voluntary and the members are persons who urge the adoption of the metric system in the United States. Many of the more active members of the association frankly desire that the adoption of the system shall be compulsory, and at the earliest possible moment consistent with existing conditions.

The book recently published by this council contains an enormous amount of data and arguments in favor of the use of the metric system. It is rather unfortunate that the council should have announced in the book that all who purchase it are enrolled as sustaining members of the "World Metric Standardization Council," without the necessity of any other payment. It is quite possible that many purchasers of this really valuable book would not care to become members of a distinctly partisan organization.

Various chapters contain reports of many scientific, commercial and independent associations, and individuals, which set forth cogent reasons for the universal adoption of the metric system. One very important chapter treats of the probable cost of change, in and to the United States, from the present system to the metric. To those who already use the metric measure this book will supply a world of proof as to why they should continue to use it. To those whose minds are open on the subject, it will do much to convince them that the metric system is superior to any other. To those whose opinions are fixed by previous study against the metric system it will have little avail. In any event, it is principally for the ones who have not taken a definite position in favor of or against the metric system.

The writer of this review has read much in pro and contra to the English system and the metric system. He has, for more than twenty years, used both systems every day. He looks upon both systems as being mathematical languages in which one can express any mathematical relation for which there may be need. He is quite familiar with the condition which exists in many countries, where mathematical languages have been made obligatory or legal. In those countries where the average of literacy is low, and only a few well educated people dictate the mathematical language to be used, the change from one form of expression to another is comparatively simple. Even so, at least one generation is required to make a perfect change. Where everybody can read and write to some degree, and really think about a great variety of weights and measures, even though it be in a simple way, the change is more difficult.

Mere laws have not driven Magyar, nor Basque, nor Guarani from the minds of the people of Austria, Spain, France and Paraguay. Neither has our own national effort been successful in eliminating the vara or league from land measure in that territory which we acquired from Mexico so long ago.

It is universally admitted that the old arbitrary English system of weights and measures has many faults. Its greatest advantage to the present generation is that the great mass of the people in many countries think in that system. There have been many opportunities to improve the system, but the people do not want their mathematical language changed and it has been changed very little. The metric system is legal in the United States, but very few ever use it. Those few engaged in international or scientific relations translate from one language to another when necessary. It is no criticism of the metric system to say that the present generation of English-speaking people will think in the present system until they are dead. Just why such efforts should be made to try to compel its use at this time is not apparent. The United States is going through one experience of prohibition at this time. It may prove successful after a period of years because it has the good health and morals of the community in its favor, but there is nothing unsanitary about the English system of feet and pounds, no moral turpitude is involved in speaking of a ton of coal in place of 1,000 kilograms.

The book is full of facts, but it is obviously partisan. For example, it is stated that "Those who obstruct the general adoption of the metric system constitute less than one per cent of the voters." It would probably be equally true, or equally false, to say that less than one per cent of the voters favor it. The plain facts of the case are that a very small group urges the compulsory adoption of the metric system and those most directly aected will oppose it. It is a question of very grave doubt if all those who participate in the combined support and opposition of the plan number one per cent of the voters.

It is a tempest in a teapot from one point of view, but very grave from another. Those most directly concerned might induce quick action for or against the compulsory adoption of the metric system by the national congress, and destroy the present satisfactory condition in the United States, where either system is legal and one's personal interests determine which he shall use.

Modern Methods of Welding As Applied to Workshop Practice. By J. H. Davies. 263 pages, illustrated. Published by D. Van Nostrand Co., New York.

This is a rather complete book in so far as the subjects treated cover a wide variety of practice and much attention is given to apparatus of various kinds. Chapter on pre-heating, on the preparation of welds, on handling cast iron, aluminum, brass and other metals, including lead burning, are given.

Various kinds of welding are included, such as oxy-acetylene, oxy-hydrogen, thermit and electric welding of the different tyes. Spot welding, butt welding and other methods are shown in considerable detail. The illustrations are very complete and are a great aid in making the text clear to the reader.

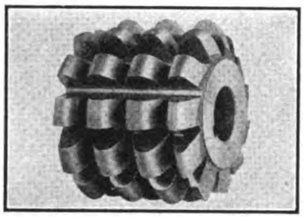
Many examples of welding of different kinds are shown, making clear such defects as slag enclosed in a welded seam. Examples are given of welding in inaccessible places by the use of mirrors. Attention is also given to the protection of the welder by the use of shields and suitable goggles. The descriptions seem to be quite complete and the reader should have no difficulty in following the directions given. Although most of the illustrations are copied from others and are not particularly clear on that account, they serve their purpose in most cases.

While this book is by an English author and naturally gives much attention to British practice, it also devotes considerable space to American methods and American apparatus. The combination should be of value to all users of welding apparatus.

Condensed-Clipping Index of Equipment

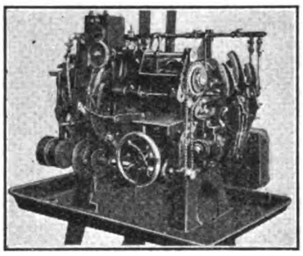
Patented Aug. 20, 1918

Hob, Sprocket Tooth, Universal
Diamond Chain and Manufacturing Co., Indianapolis, Ind.
"American Machinist," March 2, 1922



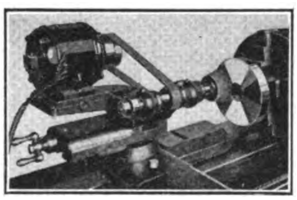
The hob operates on the principle used when cutting gear teeth, each being capable of cutting sprockets with any number of teeth for a given pitch and roller diameter. It is not limited to a small range of teeth. The teeth cut by the hob conform to the specifications for the new "American standard" tooth form, and the space angle gradually decreases as the number of teeth in the sprocket increases, and the tooth angle gradually increases. The generating action of the hob tends to produce these changes, although not at just the same rate as for the true "American standard" form.

Attachment, Slotting, Automatic Screw Machine
Davenport Machine Tool Co., Rochester, N. Y.
"American Machinist," March 2, 1922



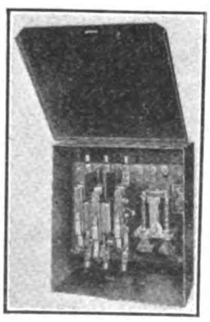
The attachment is used for slotting screws, and consists primarily of a three-hole turret mounted on a bracket, attached to the machine by bolts holding the stationary head caps in place. The saw head mounted over the revolving head uses the same change gears as the machine itself. At each forward movement one screw is picked up, another slotted and a third ejected. With slight modification, the attachment can be used for other second-operation work, such as milling, cross-drilling and burring.

Grinder, Toolpost, Universal, "Elteco"
Liberty Tool Co., Inc., Irvington, N. J.
"American Machinist," March 2, 1922



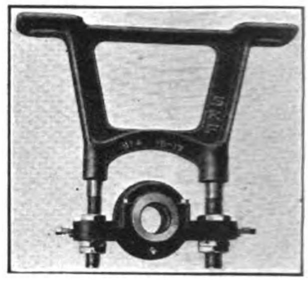
The base of the device is mounted on the swiveling toolslide of the lathe. The spindle is mounted so that its height can be adjusted, and is provided with one adjustable taper bearing. Different types of wheels and spindle extensions can be used. The machine has a 5⅛ x 1 in. wheel for cylindrical grinding, a cup wheel for face grinding and two extension arbors for internal grinding. The spindle is driven by a belt connected to a ⅓ hp. motor mounted on a slide. Both the longitudinal and transverse feeds are obtained from the lathe slides.

Starter, Induction Motor, "Thermaload"
Monitor Controller Co., Baltimore, Md.
"American Machinist," March 9, 1922



This thermal-limit starting device used with induction motors consists of a three-pole magnetic contactor and a thermal-limit relay, both mounted on a slate panel and inclosed in a metal cabinet. It is adapted to remote control, and operated by means of push buttons. It gives over-load and low-voltage protection, provides for starting at full current, voltage and torque, and automatically prevents overheating the motor. It is available in all sizes up to 3 hp. on 110-volt single-phase current, 5 hp. on either 220-volt single-phase or 110-volt polyphase, and 10 hp. on either 440-volt single-phase or 220-volt polyphase current.

Hanger, Line-Shaft, Ball Bearing
Skayef Ball Bearing Co., 165 Broadway, New York, N. Y.
"American Machinist," March 2, 1922

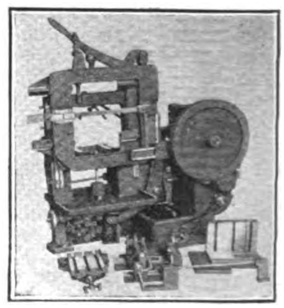


The device has a two-point suspension and carries the bearing in a split housing held by two threaded suspension rods. Vertical or horizontal adjustment can be made at the end of the housing by the locknuts and setscrews. The pressure applied while making adjustments is not transmitted to the bearing. The self-aligning feature of the bearing allows the shaft to turn with a minimum amount of friction, and prevents rubbing, heating and binding.

Calculator, Machine-Time
Simplex Calculator Co., Box 184, York, Pa.
"American Machinist," March 2, 1922

With this calculator the time required for machine-tool operations is computed for either rotating or reciprocating work or tools. For use with rotating work, the cylinder carries tables indicating the r.p.m. for diameters of from ¼ in. to 10 ft. at all ordinary cutting speeds. The range of speeds is shown above the slot on the left-hand end of the case. The slide rule bears four scales for feed, r.p.m., length and time. For reciprocating tool work the cylinder has tables giving the number of square inches planed per minute at forward and return speeds and feeds.

Saw, Shaping, Universal, High-Speed
Peerless Machine Co., Racine, Wis.
"American Machinist," March 9, 1922



The machine has a standard hacksaw blade, but in many features of construction and method of operation resembles a milling machine. The stroke of the machine is 5⅛ in. The cutting speed is changed by cone gears in a box at the rear, and three speeds of 50, 85 and 132 strokes per minute are provided. The drive is by belt at 600 r.p.m., or by a 1-hp. motor mounted on the rear and running at 1,700 to 1,800 r.p.m. Feed is adjusted by the small handwheel in the front. The machine is equipped with a vise, angle fixture and a cross-feed fixture. Height, 23 in. Floor space, 24 x 43 in. Weight, 750 pounds.

Filling Machine, Flask, Stationary or Portable
Osborn Manufacturing Co., 5401 Hamilton Ave., Cleveland, Ohio
"American Machinist," March 9, 1922

The machine is used in the foundry for filling large flasks, and is self-contained. Standard link chains carrying specially shaped buckets run on the sprockets driven by an electric motor. The capacity depends upon the amount of sand to be handled. The machine is controlled by push buttons, located at the end of the discharge chute. If the machine is stationary, the flasks may be brought to it on cars.

Clip, paste on 3 x 5-in. cards and file as desired

Trade Catalogs

Boston Gears. Boston Gear Works, Norfolk Downs, Quincy, Mass. Catalog No. 40, 1922 edition, illustrating and describing with specifications and price lists attached, a line of 600,000 standardized Boston gears. A special section of the catalog is devoted to a description of the latest models of steel and iron internal gears for use with Boston pinions of less than twelve teeth. The book presents a small, compact arrangement of material, making it easy to find any type or size of gear wanted.

Small Tools. Greenfield Tap and Die Corporation, Greenfield, Mass. Catalog No. 46-A, containing almost 400 pages of descriptive matter on taps and dies, screw plates, drills and reamers, milling cutters and pipe tools. A large variety of these various tools are described and illustrated with specifications and price lists included. Tables of British standard pipe threads, Morse and Browne & Sharpe tapers, U. S. standard gage, tables of weights of sheet copper, wire gage standards, copper wire tables, squares, cubes, circumferences and areas of circles, decimal equivalent of fractions, metric and English equivalent measures and a variety of other useful information make up this very comprehensive booklet.

Ingersoll Milling Machine. Ingersoll Milling Machine Co., Rockford Ill. A six-page circular describing the latest Ingersoll adjustable rotary milling machine. Most of the space is devoted to photographs of the machine in actual operation in the Ingersoll shops. These photographs show the various special features of the machine and tell the story better than words.

Pneumatic Drills. Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. A small circular describing the latest type of "Pigmy" No. 25, No. 375 and No. 50 pneumatic drills. Specifications for each type are included.

Refrigerating Machinery. Howe Ice Machine Co., 2815 Montrose Ave., Chicago, Ill. A twenty-page catalog illustrating and describing the principal features that make up the Howe ammonia compressors for ice and refrigerating machines. Cross-section drawings and a series of halftone photographs show the intricate details of design and construction of these machines. Several photographs of Howe refrigerating and freezing apparatus at work in factories and in ice plants are shown.

Silent Hoist. The Silent Hoist Co., Brooklyn, N. Y. Bulletin No. 16 describing the silent hoist friction drum hoist and vertical winches with gasoline engine drive, which also can be furnished with electric motor drive up to 50 hp. This new type of hoist is especially adaptable for hoisting girders in industrial plants and for construction work.

Circuit Breakers. Roller-Smith Co., 233 Broadway, New York City. Bulletin No. 560, illustrating and describing types "E" and "T" inclosed circuit breakers. Specifications and price lists are included. Bulletin No. 820, of the same company, describes a line of ammeters and voltmeters, as well as COD indicators, all products of the Roller-Smith Co.

Heat-Treating Furnaces. W. S. Rockwell Co., 50 Church St., New York City. Bulletin No. 242, a supplement to the series of educational papers previously issued by this company and intended to illustrate the variety of methods of applying the principles of proper heating and handling to different manufacturing requirements and shop conditions. This bulletin covers the influence and method of heating on the quality and cost of heat-treated products. The illustrations show the Rockwell furnaces in operation and charts show different designs and sizes of the furnaces.

Athol-Starrett Vises. Athol Machine and Foundry Co., Athol, Mass. Catalog No. 35 illustrating and describing a line of Athol-Starrett vises, hardware specialties and machinery. Among the types mentioned are U-beam vise, ratchet handle plumber's vise, combination pipe vise, quick-acting woodworker's vise, machinist's vise, drill press and milling machine vise, clamp base, stationary base and jaw, swivel base and stationary jaw, small portable grindstone, grindstone frame, bench grinder countershaft, and a large variety of parts for the various machines mentioned.

Una-Flow Engine. The Stumpf Una-Flow Engine Co., Inc., Syracuse, N. Y. A leaflet describing this new type of engine, which as its title indicates is an engine in which the steam flows through the cylinder in one direction only.

Garvin Facts. The Garvin Machine Co., New York, N. Y. An interesting pamphlet presenting some valuable suggestions in the matter of purchasing second-hand machinery. It is addressed to purchasing agents, superintendents, foremen, managers and financial officers. To each one of these executives is devoted a page in which facts concerning the purchase of second-hand machine tools are presented. It concludes with a message to prospective buyers that "your wisdom will be determined by results, not price."

"Twistest." J. S. Imlach, Ottawa, Canada. A six-page folder describing and illustrating a tool that tests connecting rods both ways at the same time, and which magnifies any error that exists. The illustrations show the operation of the device in its various positions.

Turret Machines. The Warner & Swasey Co., Cleveland, Ohio. A well prepared 36-page catalog illustrating and describing a complete line of accurate, durable machines for bar and chucking work. The contents include turret lathes, universal hollow-hexagon turret lathes for heavy operations, and plain and universal turret lathes for brass work. Each type is fully illustrated and described with tables of operations showing capacity of work which each machine is capable of performing. Three pages are devoted to codes which make it easy for the purchaser to order machines or equipment.

Whitney Coupling. Kay Manufacturing Co., Norwalk, Conn. Circular 1922 describing the Whitney free-floating coupling for transmitting power from one shaft to another, which shafts are not in alignment. A table of dimensions and a price list are included.

Small Tools. Alfred Herbert, 13 British Indian St., Calcutta, India. Alfred Herbert, Ltd. has issued a quarterly stock list including prices of the small tools handled by the company. The booklet might offer interesting comparisons to American dealers.

Simplex Jacks. Templeton, Kenly & Co., Ltd., 4020 South Central Ave., Chicago, Ill. A 24-page catalog describing a line of Simplex jacks manufactured by the above company for railroads, contractors, mining and oil producing industries, public service utilities, automobiles and trucks. It presents an interesting study of the principles that govern the capacities of jacks and presents detailed drawings of the construction of Simplex jacks so as to conform to the principles as outlined.

Jacobs Chucks. The Jacobs Manufacturing Co., 984 Park St, Hartford, Conn. A new catalog, No. 817, illustrating and describing a complete line of both Jacobs improved drill chucks and the new Jacobs super-chucks. Complete price lists of all sizes and types are included.

Bego "Little Six." The Bastian-Blessing Co., 125 W. Austin Ave., Chicago, Ill. A small folder describing the "Little Six" outfit which gets its trade name from the fact that it is made to perform six operations as follows: Welding, cutting, brazing, lead burning or welding, radiator repair, and decarbonizing. It is intended for the garage or repair shop.

Gear Grinders. The Garrison Gear Grinder Co., Dayton, Ohio. A small booklet describing the Garrison gear grinder which automatically generates perfect tooth contours of any pressure angle. The construction of the machine is described minutely.

Power King. Jones, MacNeal & Camp, Warsaw, Ind. A four-page folder describing a line of Power King electric drills embodying the special features of full ball bearings, oversize motors and two speeds. The drill is described in detail by means of an illustration with the special features numbered and described in the margin.

Handbook of Conveyor Practice. Robins Conveying Belt Co., 13 Park Row, New York, N. Y. A 96-page handbook prepared by the Robbins company as an aid to engineers and draftsmen having to do with the planning or designing of conveyor installations. It contains a group of new and useful tables concerning capacities, power requirements, speeds of conveyors and similar matters; dimensions of the various conveyor parts, together with general data on conveyor practice. There is a section devoted to the description and illustration of installations of various kinds designed and erected by this company. There are also charts for determining steam and horsepower of transmission pulleys and belts, shaft diameters, horsepower of gears, and for finding the slopes of valleys in chutes and hoppers. The book is well prepared on heavy coated stock with excellent binding and covers.

Norton Alundum Safety Tile. The Norton Company, Worcester, Mass. A twenty-page booklet giving specifications for the proper installation of Norton Alundum safety tile. This information should be invaluable to architects and engineers who use Norton tile in their construction work. A series of excellent drawings are included which show clearly the various types of construction in which this safety tile is used.

Micarta Gears and Pinions. Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa. Circular No. 1579-B of the Westinghouse company, describing and illustrating this latest development in the field of silent gearing. Micarta is a non-metallic material developed by the Westinghouse company for gear and pinion application. It can be advantageously substituted for untreated steel, cast iron, bronze and all non-metallic materials commonly employed for gearing. The bulletin gives the distinctive features and the physical and mechanical properties of micarta in detail. A table of drawings showing designs of micarta gears and two pages of gear data and horsepower rating make the catalog most complete.

Magnetic Chucks. O. S. Walker Co., Inc., Worcester, Mass. Circular W2. 16 pages describing the Walker magnetic chucks of the rectangular, swiveling and vertical face types, in all of which the single coil or single magnet type of construction is a prevailing feature of the design. The illustrations show the parts which go into the making of a Walker chuck, and give the reader an excellent idea of the operation of a complete chuck. Other illustrations show the chuck in use on grinding machines. Another section gives tables of dimensions for chucks of the rectangular type, and also specifications. Two pages of the bulletin are devoted to a description of the Walker demagnetizer.

Sandblast Machines. Hoevel Manufacturing Corporation (controlled by the L. O. Koven & Bros. Co., 154 Ogden Ave., Jersey City, N. J.). The 1922 catalog of the Hoevel concern, illustrating and describing all the latest types of sand blasting machines for industrial purposes. The book shows machines for removing scale, rust, dirt and grease from castings before nickel plating, galvanizing or painting, and for other cleaning or polishing purposes.

Worthington Diesel Engines. The Worthington Pump and Machinery Corporation, 115 Broadway, New York, N. Y. Bulletin VK-1851-A, illustrating and describing the new Worthington Diesel engine of the two-cycle, solid injection type. A large cross-sectional photograph of the engine with the parts numbered and described in the margin is a feature of the catalog.

Hammered Crucible Tool Steel. McInnes Steel Co., Ltd., Corry, Pa. A small booklet describing the line of high-grade hammered crucible tool steel products manufactured by this company. Some of the items mentioned are vanadium, cello vanadium, clear point, superior, misco, special chrome, chrome nickel, tool steel forgings, gear blanks, forgings, weldless rings, hammered spindles, axle forgings, connecting rods and McInnes special tool steel. Each one of these types is briefly described, and the proper method for hardening and tempering is given.

Monitor Thermaload Starter. Monitor Controller Co., Baltimore, Md. A circular entitled "Keep Your Machines Running," briefly describes this thermaload starter, which is suited to any kind of machinery driven by alternating current motors.

Milliken Machine Tool Specialties. Milliken Machine Co., West Newton, Mass. Small circular describing the line of standard cast-iron surface plates, bench plates, angle plates, ball turret heads and slide-rests.

Forthcoming Meetings

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

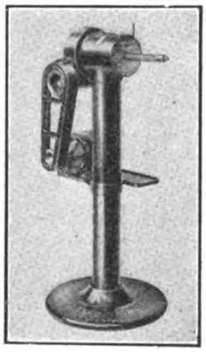
Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Reamer Driving Machine
George H. Blettner Co., 1841 W. Jackson Blvd., Chicago, Ill.
"American Machinist," March 9, 1922

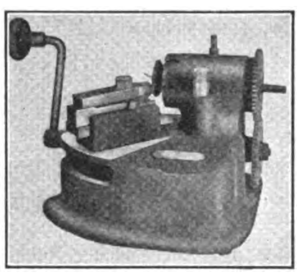


The machine furnishes power for reaming operations ordinarily done by hand. It will drive hand, expansion, adjustable or special reamers up to 1½ in. in diameter. The spindle speeds are 10, 20 and 30 r.p.m. The spindle is fitted with a 5-in. Cushman geared scroll chuck. The motor has ¼ hp. and can be supplied for either a.c. or d.c. of 32, 110 or 220 volts. Height, 42 in. Floor space, 18 x 18 in. Weight, 145 pounds.

Micrometer, Inside, Extension
Reed Small Tool Works, Cherry and Vine Sts., Worcester, Mass.
"American Machinist," March 9, 1922

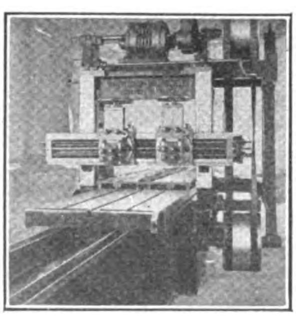
The micrometer is used to obtain internal measurements of cylinders and rings, but is useful as well in linear measurements, testing parallel surfaces, comparing gages and setting calipers. The detachable handle can be changed for right- or left-hand work. Extra rods, screwing on the threaded stud at the end of the barrel, give a change of length. The standard set consists of the inside micrometer, an adjusting wrench and five rods, giving a range from 3 to 8 in. Additional rods for measuring greater lengths, also a handle for gaging to greater depths in cylinders, can be furnished.

Lathe, Valve, Hand-Operated, "Peerless"
Steiner Brothers, Lima, Ohio
"American Machinist," March 9, 1922



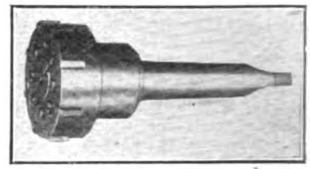
The valve is held in place in the hollow spindle by means of a special self-centering chuck. Valves having stems from ¼ to 9/16 in. in diameter and heads up to 3 in. in diameter can be held. The valve is rotated by a lever. A high-speed removable cutting tool is used, mounted in a slide that can be swung through an angle of over 30 deg. As the driving handle is turned, the toolslide is automatically fed inward. The worm wheel can be disengaged by the knurled knob at the side of the spindle housing, so that the toolslide can be moved by hand.

Planer, High-Speed
Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass.
"American Machinist," March 16, 1922



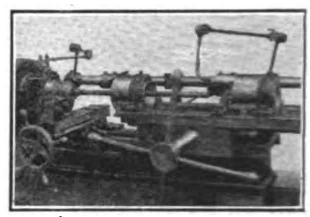
The planer table operates at a speed of 150 ft. per minute on both the cutting and return strokes. Brass screen plates about 13 x 30 in. in size are planed. The shaft carrying the tight and loose pulleys passes entirely through the bed, and carries a pulley driving the second belt. The table contains T-slots, but no holes. The steel rack extends for the full length of the table. Two heads are mounted on the crossrail, both running on the lower screw. The capacity is 26 x 32 x 18 in. Minimum distance between tools, 12 in.

Reamer, Expanding, Cylinder
Campbell Auto Works, 238 N. El Dorado St., Stockton, Cal.
"American Machinist," March 9, 1922



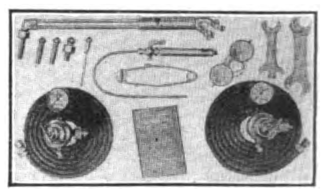
The tool is used for re-boring and finishing automobile cylinders. The head screws on a boring bar that can be fitted to any type of cylinder boring machine, and it may also be used for turret machines. It has an expansion of ⅜ in., adjusted by means of a screwdriver and a micrometer. The adjusting mechanism is concealed inside the head, and by turning the large central adjusting screw, the blades may be forced outward or inward. After adjustment, the eight screws are tightened into place and the blades thus locked in position. The tool is made in several sizes, the largest of which is 4½ in. in diameter.

Threading Machine, Staybolt
Warner & Swasey Co., Cleveland, Ohio
"American Machinist," March 9, 1922



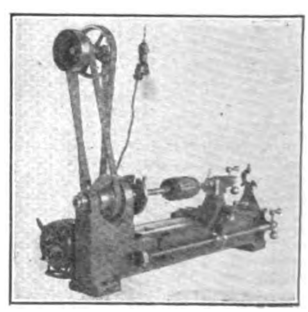
The machine is made up of the standard No. 4 turret lathe with a special attachment instead of the regular turret slide and saddle, and it may be used for the production of the studs and bolts, as well as staybolts. The machine handles crown stays, button-head stays and swivel stays up to 40 in. in length, and cuts any size of thread, using self-opening die heads. After the staybolt is chucked in position, the staybolt carriage is fed forward. The head is then formed by a forming cutter on the cross-slide, the staybolt carriage is fed forward, and the die heads close automatically and cut the threads.

Welding Outfit, "Little Six," Rego
Bastian-Blessing Co., 125 W. Austin Ave., Chicago, Ill.
"American Machinist," March 9, 1922



The outfit, made up of standard units of Rego equipment, is primarily for use in general garage repair work. The welding torch, equipped with three copper one-piece welding tips, will weld steel up to 1 in. in thickness, or with a cutting tip will cut steel up to 1 in. in thickness. Special tips are provided for brazing, lead burning or welding, and repairing radiators; and a decarbonizing torch for removing carbon from the combustion chambers of automobile cylinders. The other apparatus furnished consists of the oxygen and acetylene regulators, hose, wrenches, spectacles, spark lighter, and an instruction book.

Lathe, Bench, Motor-Driven
A. V. Carroll Machine Tool Co., Norwood, Cincinnati, Ohio
"American Machinist," March 16, 1922



The lathe countershaft is mounted on a 1¼-in. steel bar fitting in an extension support cast on the bed. The spindle has a ⅝-in. hole. The carriage, gibbed to the bed, is traversed by a long screw at the front. Feeds are operated by hand, and the driving motor can be operated from an ordinary lamp socket. Voltage and current should be specified. Equipment: motor, cord and plug, faceplate, centers, center rest and wrenches. Swing, 10 in. Distance between centers, 24 inches.

Clip, paste on 3 x 5-in. cards and file as desired

New and Enlarged Shops

Machine Tools Wanted

Cal., Los Angeles—R. Neul, 1334 East 63rd St.—one power lathe for machine shop.

Ill., Chicago—Chicago Pump Co., 2336 Wolfram St.—one 24 in. Ingersoll cutter grinder (used).

Ill., Chicago — E. Edtbauer & Co., 224 North Desplaines St.—one plain milling machine (No. 2 or 3).

Kan., Wichita—G. P. Cain, 1518 Poince St.—power drill press and emery wheel, for machine shop.

Kan., Wichita—J. O. Coleman, 106 North 3rd St.—power drills and grinders for machine shop.

Kan., Wichita—Day & Night Repair Shop, 222½ North Market St.—one power lathe.

Kan., Wichita—W. Gunning, 120 North St. Paul St.—power lathe for garage.

Kan., Wichita — H. Hoopper, Forum Garage—one power drill press and lathe.

Kan., Wichita—Palace Garage, 136 North St. Paul St.—emery wheel, drill press, lathe and cylinder grinder for power equipment.

Kan., Wichita—J. Ryan, Park Place—one power lathe.

Kan., Wichita—The Smith Machine Shop, 132 North Lawrence St., O. G. Smith, Purch. Agt.—power lathe and automobile cylinder grinder.

Kan., Wichita—Standard Cutlery Co., 154 North Market St., F. Mercier, Purch. Agt. —one power grinder for sharpening cutlery.

Kan., Wichita — Wichita Desicating Co., 911 Bentley Ave., J. R. Johnson, Purch. Agt.—one power lathe and one drill press.

Mich., Detroit—The F. J. Lamb Co., 928 Franklin St.—Numbers 1 and 2 Warner and Swasey hand screw machines.

Mich., Saginaw—I. L. Gunther, 128 North Franklin St.—one 10 x 30 in. Norton grinder.

Neb., Lincoln—J. H. Markel Motor Co., 1726 O St., W. F. Boys, Purch. Agt.—one 20 in. drill press, one 18 in. lathe, 7 or 8 ft. bed, both with motor attached; one air hammer, one air hose and attachments for 12 openings; one motor cleaning machine; blacksmith shop equipment including anvil, forge, and small tools; one bench grinder; one chain hoist and machine; one electric test stand.

Neb., Lincoln — Reliable Auto Tinners, 238 South 10th St., H. Fattig, Purch. Agt.—one power emery wheel and grinder, combined.

N. Y., Lewiston—F. Seick—machinery and tools for garage and repair shop now under construction.

N. J., Newark—W. H. Hall, 583 18th Ave.—50 lb. trip hammer.

N. Y., New York—The Cornell Iron Wks., 601 West 26th St.—one power punch press.

N. Y., Rochester—Brockway oMtor Truck Co., Cortland—machinery and equipment for service station and shop.

N. C., Asheville — Asheville Supply & Fdry. Co., H. J. Sutton, Secy.-Pres.—one 24 or 36 in. punch and shear, belt or electrically driven.

O., Cleveland—The Bd. of Educ., East 6th and Rockwell Sts., H. E. Boppel, Purch. Agt.—four saw benches, one cabinet planer, one hollow chisel mortiser, one block sander, four band saws, four hand jointers, four oil stone grinders, four lathes, four 10 in. bench drill presses, four 2 wheel grinders, four squaring machines, four bar folding machines, four punch and shear machines, four forming rollers, four burring machines, four turning machines, four wiring machines, four hand forges, for use in Audubon, Patrick Henry and Rawlings Junior high school.

O., Columbus — Modern System Grocery Co., 178 North 4th St., J. W. Baker, Pres. —equipment for proposed garage, on Lazell and Hickory Sts., capacity, 30 grocery trucks.

O., Columbus—The Sterns Lubricator Co., 395 East Broad St., C. H. Neil, Pres.—boring machines, grinders, polishers, etc., for new plant, at Cleveland Ave. and Colfax St.

O., Logan—Logan Fdry. & Machine Shop —machinery and equipment for large addition.

Pa., Frankford — Fidelity Machine Co., 4015 Paul St.—additional machinery for new factory.

Pa., Phila. — Rochlis Iron Wks., 1518 North 5th St.—shearing machinery, punch presses and bending machines for ornamental iron work.

Va., Waynesboro — Service, Gas and Supply Co., K. P. Wright, Mgr.—small tools and equipment for garage.

Wis., Milwaukee — The Economy Sheet Metal Wks., 305 Grove St., H. Rumpel, Purch. Agt.—30 in. square shears.

Wis., Milwaukee—Nash Motors Corp., Clement and Oklahoma Ave., (address Purch. Dept. Plant No. 4)—punch presses, boring machines, and other machinery and equipment for new plant now under construction, (body plant and sheet plant).

Wis., Milwaukee—J. Zapf, 1341 40th St.—one saw table, 1 sticker, and electric motors.

Ont., Galt—A. D. Porter Mfg. Co., Hobson St.—equipment and tools for the manufacture of pressed steel and brass products for the plumbing trade, and specialties for hardware, shoe and furniture trades.

Ont., Peterborough—Motors & Machines, Ltd., A. E. Adams, Pres. & Mgr.—equipment for machine shop.

Ont., St. Williams—McCall & Co.—one 12 in. 4 sided planer, one 24 and one 26 in. 1 sided planer, one re saw, one swing saw 6 in. frame and two r.i.p. saws, one variety saw and one 36 in. band saw, one high speed shaper, one sash sticker, one 2 spindle boring and one 4 spindle verticle boring, one 16 in. and one 12 in. jointers, one elbow sander and one 2 drive sander, one turning lathe, one band saw filer, one blower side face, one chain mortiser.

Que., Montreal—H. J. Bowen, 293 Notre Dame St. W.—one small lathe and complete equipment for garage and repair shop.

Que., Montreal—I. P. Choquette, 900 St. Denis St.—one grinder, small machinery and tools for garage and auto repair shop.

Machinery Wanted

Cal., Los Angeles—Bittleston Shop, 335 South Los Angeles St.—tinners machinery.

Fla., Jacksonville—H. W. Dexter, 16th St.—one 20 ton sidewheel, M. C. B. equipped locomotive crane; one 30 h.p. single driven hoisting engine; two 30 h.p. double driven hoists with boilers; one 650 kw. 240 volt D.C. generator, belt driven.

Fla., Lakeland—Non-Acid Fertilizer and Chemical Co., H. E. Memminger, Mgr.—machinery and equipment for proposed fertilizer plant, incl. engines, boilers, dryers, tanks, etc.

Fla., Leesburg—The Municipal Ice Plant, W. E. Rogers, Mgr.—additional machinery for ice plant.

Fla., Milligan—J. L. and C. Wilkinson Mfg. Co., C. Wilkinson, Secy.—additional machinery for the manufacture of crates and boxes at woodworking plant.

Ga., Atlanta — The Western Newspaper Union, 127 Central Ave., brokers,—Meihle or Premier press, automatic feeder for cylinder press for power equipment.

Ill., Chicago — The Western Newspaper Union, 210 South Desplaines St., brokers—8 page double driven angle bar Duplex press power equipment.

Ill., Sycamore—Chicago Wire & Mfg. Co.—one cement mixer, 1 or 2 yd. capacity.

Kan., Girard—W. H. Wayland—automatic air outfit, tank, pump belt and motor.

Kan., Wichita—J. Coss, 716 North Market St.—woodworking machinery, combination saw, planer and cutting off equipment for power.

Kan., Wichita—The Brooks Letter & Addressing Co., 144 North Market St., H. O. Brooks, Purch. Agt.—power paper cutter and job press with Miller feeder.

Kan., Wichita—West Side Planing Mill Co., West Side—one power sander for wood working.

Mo., Kansas City—Midwest Auto Supply Co., 416 East 15th St.—automatic air outfit pump and motor air tank.

Mo., Kansas City—E. N. Wright, 707 Sharp Bldg.—stereotype machinery, incl. 1 moulding machine; 1 full page shaving machine; one 8 column flat casting box for both thin plate and type high; 1 saw trimmer and 1 steam table.

Mo., Valley Park—Barbour Boat Co.—tinsmith tools, furring machine and turning machine.

N. Y., Addison—Dairymen's Co-operative League Assn., H. E. Austin, Mgr. Cheese Factory—machinery and complete equipment for the manufacture of cheese.

N. Y., Binghamton—Tichener Iron Wks., L. E. Barnes, Secy.—machinery and equipment for proposed addition to architectural and ornamental iron works.

N. Y., Buffalo—J. Brand, 502 Swan St.—equipment for proposed bakery, at 369 East Genesee St.

N. Y., Buffalo—H. R. Conners and A. McClerie, Military Rd. and Hertel Ave.—one gasoline pump, 1 gas tank, 2,000 gal. capacity, and other minor equipment for proposed service station.

N. Y., Buffalo—Harvey Laundry Co., Inc. —extractors, revolving tubs, and other machinery and equipment for proposed laundry.

N. Y., Dansville—Newfield Gas & Oil Co., Inc.—pumps, pipe, machinery and equipment for gasoline extraction plant.

N. Y., Niagara Falls—Kimberly-Clark Paper Co., Packard Rd.—grinders (paper), machinery for pulphouse, also machinery and equipment for screen room, etc., for proposed factory.

N. Y., Painted Post—S. Miles, R. D. 1—large power grain binding machine.

N. Y., Patchogue—Advance, J. A. Canfield, Purch. Agt.—newspaper folder, power saw trimmer and router.

N. Y., Rochester—J. C. Haag, Fernwood Ave.—gas pump, air compressor, tank and general machinery and equipment for large commercial garage now under construction.

N. Y., Syracuse—Cloverland Ice Cream Co., 533 South Ave.—equipment and machinery for ice cream plant now under construction.

N. Y., Vestal—Universal Instruments & Metal Co., R. Mulliner, Pres.—special machinery and equipment for the manufacture of patented clothes line fasteners.

N. C., Brevard — H. C. Brevard — machinery for proposed ice and cold storage plant.

N. C., Washington—R. R. Zoeller, Cotton Mill—cotton gin, also blower and power pump to be used with cotton presses (used).

N. C., Wilmington—The Lingo City Metal Wks., T. D. Love, Purch. Agt.—veneer and slat making machines for veneer crates.

O., Cleveland—E. F. Hauserman Co., 1729 East 22nd St.—one draw bench for cold drawn steel shapes, chain beam and gearing 15 tons, length of beam 50 ft., head to have 8 openings and adjustable side gauges.

O., Cleveland—The Hunting Constr. Co., 823 Cleveland Discount Bldg.—one ¾ yd. grab bucket locomotive crane.

O., Columbus—Dept. Pub. Welfare, 9th and Oak Sts., H. S. MacAyeal, Dir.—bakery and mixing machines, ovens etc., laundry equipment, extractors, mangles and washing machines all for laundry and bake shop to be erected at Institution for Feeble Minded.

O., Marion—The Harding High School Students, H. R. McVey, Supt.—complete printing establishment. Estimated cost $1,000.

O., South Euclid—Random Shots, H. E. Burdett, Purch. Agt.—newspaper press and power paper cutter.

The Weekly Price Guide

Rise and Fall of Market

Advances.—Rise in coke prices forces No. 2 foundry iron up $1 per gross ton in New York, Birmingham, Pittsburgh and Chicago. Pittsburgh price of $1.60 per 100 lb., for structural shapes, plates and bars, giving way to quotations of $1.70@$1.75; steel bars principally affected. Blue annealed sheets up 15c in New York; Chicago quotes rise of 25c on blue annealed, 20c. on black and 15c. per 100 lb. on galvanized sheets. New York warehouses advance openhearth spring steel, ½c.; bands and hoop steel 25c.; tank and floor plates, shapes and bars, 10c. per lb. Chicago advances coppered bessemer rods and hoop steel, 35c.; floor plates, cold drawn shafting, squares, flats, hexagons, etc., 10c.; shapes and bars, 30c. per lb.

Zinc quoted at 6¼c. as against 6c. per lb., New York: markets weaker in electrolytic copper, lead and tin. Wrought brass and copper ½c. higher in New York and Cleveland. Solder up 2c. in New York; babbitt metal up ½c. per lb. in Cleveland.

Declines.—Raw linseed oil down 2c. per gal. in New York and Chicago. Machine oil reduced 10c. and lard cutting oil 5c. per gal. in New York.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$23.50
Northern Basic	25.02
Southern Ohio No. 2	25.02
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	29.16
BIRMINGHAM	
No. 2 Foundry	18.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	26.82
Virginia No. 2	28.74
Basic	25.50
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	23.00
No. 2 Foundry, Southern, sil 2.25@2.75	25.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.00
Basic	25.00
Bessemer	25.00

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.5	5.0	3.0
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cleveland	6.75	4.5	2.6
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2 40	3.63	3.15	3.63
No. 12	2.45	3.68	3.20	3.68
No. 14	2.50	3.73	3.25	3.73
No. 16	2.70	3.83	3.35	3.83
Black				
Nos. 17 and 21.	3.00	4.15	3.55	4.30
Nos. 22 and 24.	3.05	4 20	3.60	4.30
Nos. 25 and 26.	3.10	4 25	3.65	4.35
No. 28	3.15	4.35	3.90	4.45
Galvanized steel sheets:				
Nos. 10 and 11.	3.30	4.35	3.75	4.45
Nos. 12 and 14.	3.40	4.45	3.85	4.55
Nos. 17 and 21.	3.55	4.75	4.15	4.85
Nos. 22 and 24.	3.70	4.90	4.45	5.00
No. 26	3.85	5.05	4.60	5.15
No. 28	4.15	5.35	4.90	5.45

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6@8	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.85
Hoop steel	3.63	2.81	3.48
Cold rolled strip steel	6.25	8.25	6.15
Floor plates	4.80	4.66	5.08
Cold finished shafting or screw	3.35	3.00	3.40
Cold finished flats, squares	3.85	3.50	3.90
Structural shapes (base)	2.68	2.51	2.68
Soft steel bars (base)	2.58	2.41	2.58
Soft steel bar shapes (base)	2.58	2.41	2.58
Soft steel bands (base)	3.23	3.06	2.58
Tank plates (base)	2.68	2.51	2.38
Bar iron (2.10@2.20 at mill)	2.58	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/32	8.00		12@13
1/8	6.50		11@12
5/32 to 1/4	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.62½
Tin, 5-ton lots, New York	32.12½
Lead (up to carlots), St. Louis, 5.65; New York	6.50
Zinc (up to carlots), St. Louis, 5.42½; New York	6.25

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	6@6.12½	7.50	6.25
Copper sheets, base	20.50	20@21½	23.00
Copper wire (carlots)	16.00	16.50	16.25
Copper rods (ton lots)	19.00	21.50	19.50
Copper tubing (100-lb. lots)	22.75	23.00	23.00
Brass sheets (100-lb. lots)	16.75	17.50	18.75
Brass tubing (100-lb. lots)	20.00	19.00	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.75	15.50	15.75
Brass wire (carlots)	17.25	17.75	.....
Zinc sheets (casks)	8.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	....
Solder (½ and ½), (caselots)	25.00	22.00	19.00
Babbitt metal (fair grade)	35.00	42.50	36.00
Babbitt metal (commercial)	15.50	16.00	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	11.75	10.25
Copper, heavy, and wire	12.00	11.25	9.25
Copper, light, and bottoms	10.00	9.50	8.25
Lead, heavy	4.75	....	3.65
Lead, tea	4.25	3.50	3.00
Brass, heavy	7.00	6.50	....
Brass, light	6.00	5.00	4.75
No. 1 yellow brass turnings	6.50	6.00	5.00
Zinc	3.00	3.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

			New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:					
IC,	20x28,	112 sheets	20.00	18.25	18.50
IX,	20x28,	112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:					
IC,	20x28,	112 sheets	17.00	16.00	17.00
IX,	20x28,	112 sheets	20.00	18.75	19.60
Coke Plates, Bright					
Prime, 20x28 in.:					
100-lb.,		112 sheets	12.50	11.00	14.50
IC,		112 sheets	12.80	11.40	14.80
Terne Plate					
Small lots, 8-lb. Coating:					
100-lb.,	14x20		7.00	5.60	7.25
IC,	14x20		7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb.	.055@.09	.09	.09
Wiping cloths per M., 13½x13½	....	50.00	55.00
Wiping cloths per M., 13½x20½	....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb.	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.86	1.00	.96
White lead, dry or in oil	100 lb. kegs.	New York, 12.50	
Red lead, dry	100 lb. kegs.	New York, 12.50	
Red lead, in oil	100 lb. kegs.	New York, 14.00	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville		per net ton	$7.00
Coke, prompt foundry, Connellsville		per net ton	$7.50

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60-10%	60-10%	60%
1⅛ and 1¼x3 in. up to 12 in.	60%	60-10-10%	60-10%
With cold punched sq. nuts	40%	....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	....	$4.00 off
Button head bolts, with hex. nuts	30%	$3.90 net	.....
Hex. head and hex. nut bolts	35%	....	65-5%
Lag screws, coach screws	60-5%	....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	45%	60%	50-5%
Bolt ends, with hot pressed nuts	55%	....	55%
Tap bolts, (h. h. plus std. extra of 10%)	15%	....	.....
Semi-finished nuts ⅝ and larger	70%	75-5%	80%
Case-hardened nuts	65%	....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$5.00	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	5.00	3.50	3.50
Washers, round plate, per 100 lb. Off list	5.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.25	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-10%	70%	60-10%
Rivets, tinned	60-10%	70%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.60	$3.25	$3 10
Cone heads, ditto (net)	3.70	3.35	3.20
1¼ to 1⅜-in. long, all diameters, *EXTRA* per 100 lb.	0.25	....	0.15
⅞ in. diameter *EXTRA*	0.15	....	0.15
½ in. diameter *EXTRA*	0.50	....	0.50
1 in. long, and shorter *EXTRA*	0.50	....	0.50
Longer than 5 in. *EXTRA*	0.25	....	0.25
Less than 200 lb. *EXTRA*	0.50	....	0.50
Countersunk heads *EXTRA*	0.35	......	$3.35 base
Copper rivets	55-5%	50%	50-10%
Copper burs	35%	50%	......

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.40	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50-5%	60-10%
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	35%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

Okla., Tulsa—G. S. Henry, 311 Kennedy Bldg.—one National machine (number 2) for oil drilling.

Pa., Franklin—Galena Signal Oil Co., C. A. Miller, Supt.—equipment and machinery for proposed refinery at Point Richmond, Cal.

Pa., Franklin—Lakeside Refining Co.—large cracking stills for refinery.

Pa., Pittsfield—M. E. Barton, Route 1—machinery and equipment for shoe repair shop.

Pa., Ridgway—H. R. Smith & Co.—machinery and equipment for proposed tannery, at West Hickory.

Pa., Sharon—Sharon Furniture Co., Inc., J. Canteloupe, Pres.—Machinery for the manufacture of furniture.

Pa., Sharon—The Valley Packing Co.—machinery and equipment for proposed fruit packing plant addition.

Pa., York—F. A. Burrows Mfg. Co., J. J. Mace, Purch. Agt.—machinery and equipment for the manufacture of steam appliances.

S. C., Saluda—R. H. Etheridge, Woodworking mill—four side planer and masher, for use with blower system (used).

S. D., Florence—J. O'Neil—complete printing outfit, presses, paper cutter.

Tenn., Nashville—Hermitage Portland Cement Co., 3rd Ave. N., R. T. Miller, Secy. & Mgr.—receiving bids until July 1, on cement mill machinery and equipment for plant under construction.

Va., Cedarbluff—Clinch Valley Blanket Mill—equipment (for the manufacture of blankets and similar cotton and woolen goods) incl. engines, boilers, spoolers, extractors, looms, rag-pickers, etc.

Va., Norton—Norton Mattress Co., C. M. Bandy, Pres.—additional machinery and equipment for plant.

Va., Stuart—Stuart Cold Storage Co., J. F. Reynolds, Secy.—cold storage machinery and equipment.

Va., West Point—J. W. Marshall, flour mill—geared air conveyor equipment for sucking wheat from holds of vessels, (new or used).

W. Va., New Martinsville—Bd. of Educ., S. Bruce Hall, Pres.—equipment for vocational department of proposed high school.

Wis., Cudahy—Cudahy Brown Co., 626 Whitaker Ave., J. Lewanowsky, Purch. Agt.—special machinery for the manufacture of brooms.

Wis., Janesville—The City of Janesville c/o Clerk—machinery and equipment, including bucket conveyors, for gravel pit.

Wis., Mellon—Universal Toy & Novelty Co.—woodworking mchy. for proposed toy factory.

Wis., Milwaukee—Barg & Foster, 171 Bway; W. H. Barg, Purch. Agt.—machinery for the manufacture of candy, incl. gas furnace.

Wis., Milwaukee—N. J. Bertha, 1004 Newhall St.—one electric charging machine for garage.

Wis., Milwaukee—H. J. Esser, 82 Wisconsin St., Archt. and Engr., for Claybourn Process Corp.—one 3 ton and one 10 ton cranes for proposed plant.

Wis., Milwaukee—M. Feldman, 1513 Cherry St.—complete equipment and machinery for laundry.

Wis., Milwaukee—The Kidwell Boiler & Engine Co., 288 East Water St.—boiler shop equipment.

Wis., Omro—Omro Co-operative Butter & Cheese Co.—equipment for proposed modern creamery and cheese factory.

Wis., Racine—Belle City Incubator Co., 15th St.—one monorail crane.

Wis., Slinger—E. C. Kohl—machinery for laundry.

Wis., Wautoma—L. Chaimson—seed grinding machinery to be used with gas engine power.

Ont., Huntsville—Muskoko Wood Mfg. Co.—special machinery and equipment for the manufacture of wood products for proposed plant.

Ont., London—Carling Brewery Co.—equipment for the manufacture of near beer.

Ont., Ottawa—F. H. Plant, Ltd., 107 Murray St.—woodworking machinery for proposed wagon factory.

Ont., Toronto—The Wilson-McGovern Co., Ltd., Lumsden Bldg.—one 15 ton, four wheel, narrow gage locomotive crane (used).

Ont., Welland—Universal Casket Co., B. A. Basque, Pres.—special machinery for the manufacture of caskets for proposed plant.

Que., Montreal—S. Meer, 1618 Bordeaux St.—equipment for blacksmith shop and foundry.

Metal Working Shops

Cal., Bakersfield—Atchison, Topeka & Santa Fe R. R., Ry. Exch., Chicago, Ill., is having plans prepared for the construction of machine shops, etc., on a 20 acre site, here. Estimated cost $400,000. R. B. Ball, c/o Atchison, Topeka and Santa Fe R. R., 221 South Bway, Los Angeles, Ch. Engr. Coast Line Div.

California—Hurley Machine Co., West 22nd and South 54th Aves., Cicero, Ill., plans to build an electrical manufacturing plant, on the Pacific Coast, here. Site not yet purchased. Estimated cost $1,000,000.

Ill., Chicago—Mundie & Jensen, Archts., 139 South La Salle St., are receiving bids for the construction of a 1 and 2 story 30 x 299 and 157 x 299 ft. storage and garage buildings, on Lawrence St. near Western St., for The Fair Department Store, State and Adams Sts. Estimated cost $230,000.

Mich., Detroit—Fisher Body Co., Genl. Motors Bldg., had plans prepared for the construction of a 6 story, 102 x 979 ft. factory addition for the manufacture of automobile bodies, on Fort St. A. Kahn, 1,000 Marquette Bldg., Archt.

Mich., Grand Rapids—Hayes-Iona Co., Inc., Muskegon St., N. W., plans to build a factory addition for the manufacture of auto bodies. Private plans. Engineer not announced.

N. J., Mt. Holly—Folsom & Stanton, Archts., 10 South 18th St., Phila., are receiving bids for the construction of a 1 story, 40 x 100 ft. garage, here, for W. D. Marren, Mt. Holly. Estimated cost $40,000.

N. J., Perth Amboy—Standard Underground Cable Co., 50 Church St., New York City, is receiving bids for the construction of a 3 story, 50 x 150 ft. factory on Washington St., here. H. J. Lewis, 336 4th Ave., Pittsburgh, Pa., Engr.

N. Y., Brooklyn—Studebaker Co. of Amer., 1700 Bway, New York, has awarded the contract for the construction of a 3 story, 190 x 220 ft. service building, on Dean St., here. Estimated cost $275,000.

N. Y., Buffalo—H. N. Kraft, (representing owner) 26 Summit Ave., plans to build an 8 story garage, on Main and Elmwood Sts. Owner's name withheld. Architect not announced.

N. Y., New York—O. Sinauer, c/o N. Langer, Engr and Archt., 81 East 125th St., will build a 1 story garage, at 234 West 154th St., by day labor. Estimated cost $50,000.

N. Y., Rochester—Brockway Motor Truck Co., Cortland, is receiving bids for the construction of a 49 x 176 ft. service station, 18 ft. high, on South Ave., here. Estimated cost $20,000. Architect not announced.

O., Canton—Pearl Motor Car Co., plans to build a 2 story garage, and will have 18,000 sq.ft. of floor space exclusively for sales, at 6th and Market Sts. Estimated cost $175,000.

O., Cleveland—Ferro Machine and Fdry. Co., 3166 East 66th St., has awarded the contract for the construction of a 1 story, 66 x 160 ft. warehouse and machine shop. Estimated cost $50,000. Private plans.

O., Cleveland—The York Ohio Ice Machine Co., 1106 Woodland Ave., has awarded the contract for the construction of a 2 story, 100 x 132 ft. factory, office and warehouse, at West 28th St. and Washington Ave. Estimated cost $60,000. E. McGeorge, 1900 Euclid Ave., Archt.

Pa., Charleroi—G. Woodward, plans to build a 3 story, 88 x 100 ft. service and repair shop. Estimated cost $45,000. Private plans.

Pa., Phila.—Fidelity Machine Co., 4015 Paul St., has awarded the contract for the construction of a 1 story, 86 x 160 ft. and a 2 story, 40 x 86 ft. machine shop, at Pike St. and Frankford Ave. Private plans.

Pa., Phila.—Osman & Holman, 121 West Wyoming St., are receiving bids for the construction of a 2 story, 89 x 125 ft. garage, on Green St. and Queen Lane. Estimated cost $60,000. Private plans.

Pa., Phila.—Supplee-Wills-Jones Co., 26th and Jefferson Sts., has awarded the contract for a 2 story, 80 x 90 ft. garage and service building, at 1520 North Stillman St. Estimated cost $55,000. Private plans.

Pa., Pittsburgh—J. D. McIlroy & Sons, 508 2nd Ave., is having plans prepared for the construction of a 1 story factory for the manufacture of sheet metal products. Estimated cost $40,000. Private plans.

R. I., Providence—Power & Mayer Mfg. Co., 150 Chestnut St., are having plans prepared for the construction of a 2 story, 90 x 90 ft. factory addition, for the manufacture of jewelry, on Chestnut and Elm Sts. Estimated cost $50,000. Perry & Whipple, Rhode Island Hospital Trust Bldg., Engrs. and Archts.

W. Va., Parkersburg—Seward Wire Co., 17 West 42d St., New York, has awarded the contract for the construction of a 1 story, 60 x 80 x 200 ft. manufacturing plant, here. Estimated cost $200,000.

W. Va., Sisterville—Grant Automatic Flowing Valve Co. plans to build a 1 story, 80 x 100 ft. manufacturing plant. Estimated cost $40,000. F. J. McCoy, Secy. Architect not selected.

Wis., Appleton—Scolding Lock Hair Pin Co., 844 College Ave., has awarded the contract for the construction of a 1 story, 40 x 200 ft. factory. Estimated cost $50,000.

Wis., Madison—Madison Gas & Electric Co., 120 East Main St., has awarded the contract for the construction of a 1 story, 50 x 75 ft. garage on Blount St. Estimated cost $40,000.

Wis., Madison—J. Peterson, 102 South Orchard St., has awarded the contract for the construction of a 1 story, 114 x 117 ft. garage, on Monroe St. Estimated cost $50,000.

Wis., Milwaukee—M. Tullgren & Sons, Archts., 425 East Water St., will soon award the contract for the construction of a 5 story, 100 x 150 ft. garage, for the Sixth St. Garage Co., c/o Architects. Estimated cost $200,000.

Wis., Pittsville—P. A. Hagen, Marshfield, plans to build a 1 and 2 story, 75 x 80 ft. garage. Estimated cost $50,000. Architect not selected.

Wis., Wausau—D. J. Murray Mfg. Co., has awarded the contract for the construction of a 1 story, 60 x 228 ft. machine shop addition. Noted May 18.

Ont., Galt—A. D. Porter Mfg. Co., Hobson St., plans to build a specialties plant for the manufacture of pressed steel and brass products for the plumbing, hardware, shoe and furniture trades.

General Manufacturing

Cal., Alameda—H. Hirschbeck, 2143 Alameda Ave., has awarded the contract for the construction of a 1 story dyeing and cleaning plant, at 2309 Encinal Ave. Estimated cost $5,850.

Pa., Phila—Barrie & Sons, 1312 Walnut St., has awarded the contract for the construction of a 3 story, 22 x 106 ft. printing building. Estimated cost $80,000. Private plans.

Va., Suffolk—Parker Buggy Co. plans to rebuild its plant which was recently destroyed by fire. Loss $150,000. D. E. Parker, Pres.

Wis., Cudahy—Bd. of Vocational Educ. plans to build a 2 story vocational school. Estimated cost $75,000 to $100,000. J. P. Beuscher, Secy. Rosman & Wierdsma, 424 Jefferson St., Milwaukee, Archts.

Wis., Milwaukee—H. E. Krueger, 1014 Holton St., has awarded the contract for the construction of a 2 story, 30 x 50 ft. bakery on Holton St.

Wis., New London—Hamilton & Sons Cannery Co., has awarded the contract for the construction of a 2 story, 50 x 75 ft. cannery factory. Estimated cost $45,000.

Ont., Bowmanville—Thomson Knitting Co. has awarded the contract for the construction of a 2 story, 50 x 150 ft. knitting mill. Estimated cost $100,000. A. Wilson, Mgr.

Ont., Ottawa—F. H. Plant, Ltd., 107 Murray St., has awarded the contract for the construction of a factory for the manufacture of wagons.

Ont., Owen Sound—Bd. of Educ. plans to build a technical school, including manual training department, physics and chemistry laboratories, etc. Estimated cost $200,000. F. H. Rutherford, Secy.

Ont., Toronto—Coca-Cola Co., 65 Bellwoods Ave., plans to build a 2 story, 100 x 260 ft. coca-cola plant. Estimated cost $200,000. G. A. Porter, Mgr.

Ont., Toronto—J. Kronick, c/o L. Coldoff, 313 Grace St., has awarded the contract for the construction of a 3 story, 50 x 118 ft. steam laundry on Bloor and Grace Sts. Estimated cost $25,000.

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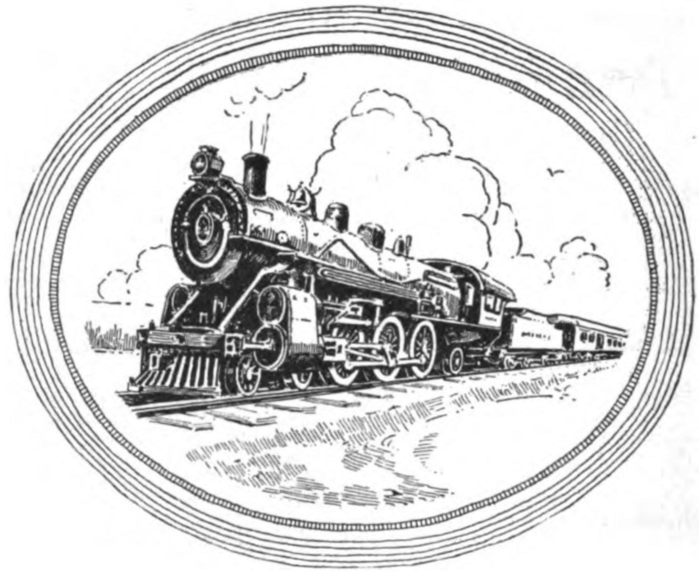

The Old Reliable Locomotive

It would be hard to find a more staple product than our old reliable friend—the steam locomotive. It has grown in these days of heavy freight and fast passenger trains from the old 40-ton locomotive of perhaps 30 years ago to the 100-ton passenger engine and the puller of freight which runs up to double this in some instances.

Taking a modern locomotive of the Pacific type, with a four-wheel truck in front, six drivers and a pair of trailers, we find the material used about as follows:

	lbs.
Cast Steel	64,000
Machine Steel	80,000
Cast Iron	30,000
High Carbon Steel	25,000
Brass	5,000
Total	204,000

The machining of these parts takes big lathes, planers, boring mills and drilling machines. The class of work has to be good to stand the pounding of the traffic. And the price—well it varies considerably—but at present is perhaps about $60,000—so near to 30 cents a pound there isn't much use of figuring.

Of course you can't compare the locomotive with any kind of a machine tool. But its great weight puts it more nearly in the big boring mill and planer class than anything else. It has to be good work of course, but certainly not better than required in the boring mill or planer. Yet the pound price is higher than that of the best boring mill or planer.

But—

When you buy machine tools—you buy production—not pounds

American Machinist, New York

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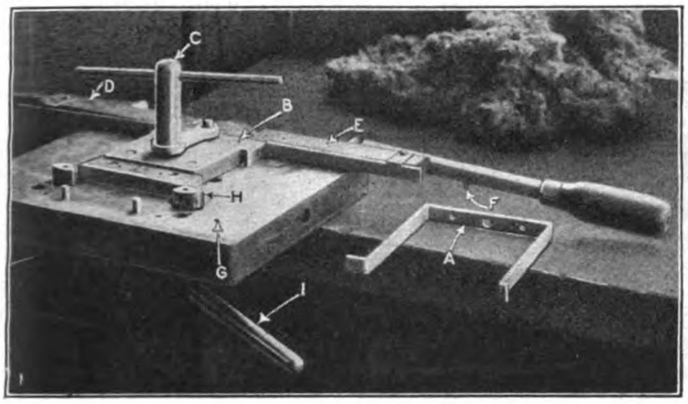
The Making of Radio Apparatus

Some of the Methods Used in Making the Various Metal Parts in the Winding of Coils and in the Assembling of the Complete Apparatus

BY FRED H. COLVIN
Editor, *American Machinist*

THE use of radio, due to the fascination of taking things out of the air and the broadcasting of interesting news and music to be picked up, has become phenomenal. Factories are taxed to their utmost to supply radio apparatus and new ones are springing up almost overnight. The American Radio and Research Corporation, Medford Hillside, Mass., while not a newcomer in the field, has a very interesting and modern factory that has been in operation several years. Its experience in making radio apparatus for the Navy during the war put it in an excellent position to take up and develop what we may call amateur apparatus.

The illustrations that follow will show some of the ingenious methods devised by production manager M. P. Stevens, and others for producing interchangeable parts such as is necessary in quantity production. Back of this production, however, is the design of the various "Amrad" units, to standard outside dimensions so they can be readily assembled either as separate units or combined into more complete apparatus at will.



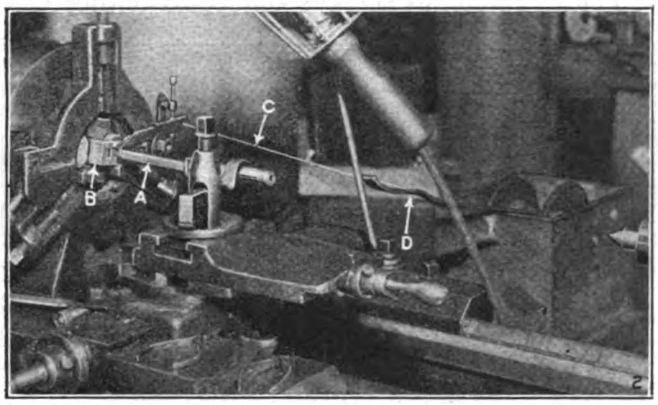


FIG. 1. BENDING ALUMINUM FRAMES. FIG. 2. WINDING COILS FOR RHEOSTATS

FIG. 3. BENDING THE VARIOUS WIRE CONNECTIONS

As will be seen in later illustrations, the large number of frames, such as shown at *A* in Fig. 1, are bent up from aluminum alloy strips. These strips are first punched with the three holes shown and are then placed in the bending fixture, being located by a pin in

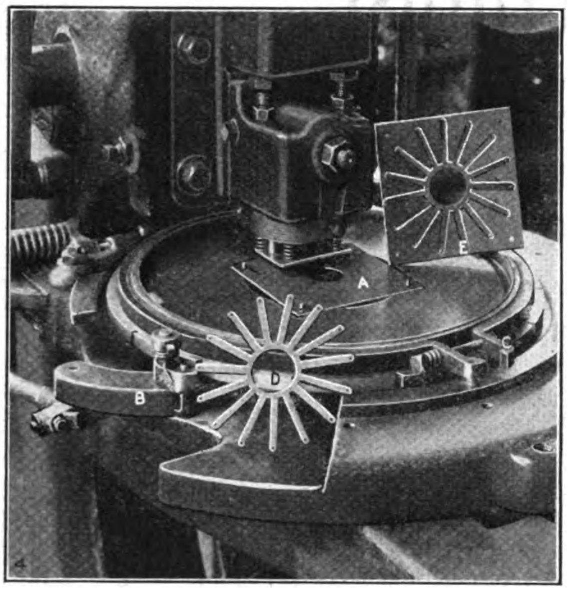


FIG. 4. PUNCHING SPIDERS FOR THE VARIOMETERS. FIG. 5. WINDING THE BASKETBALL VARIOMETERS

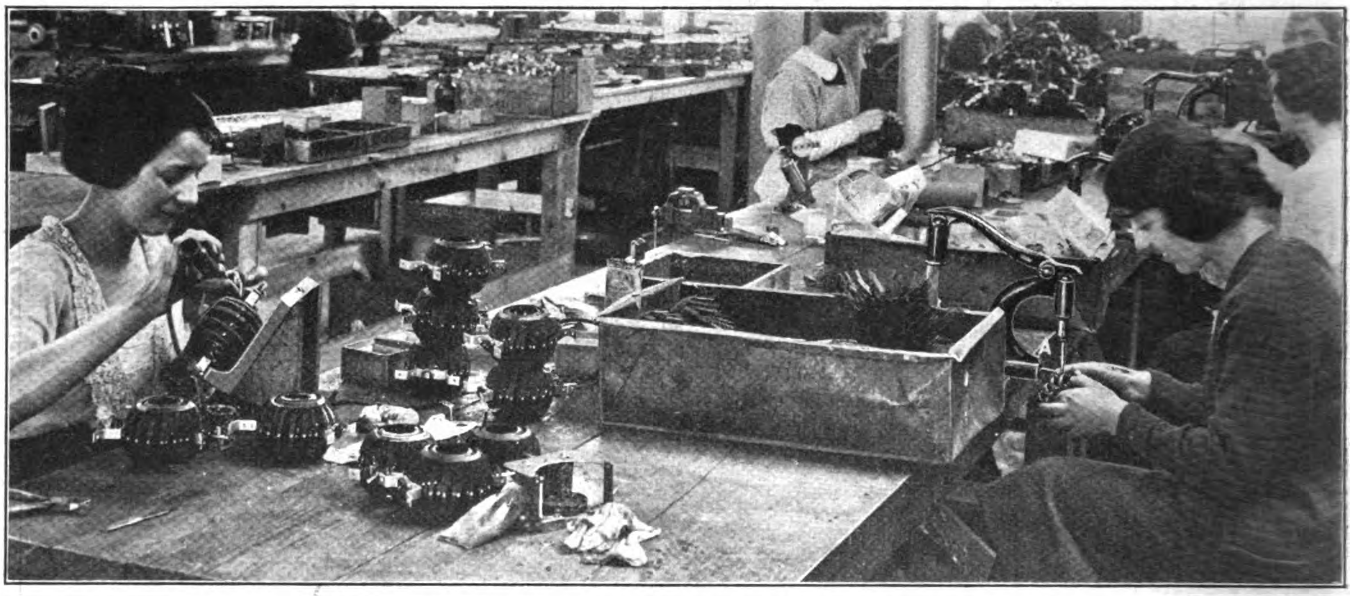


FIG. 6. ASSEMBLING THE VARIOMETERS AND SOLDERING CONNECTIONS

the block *B* which fits into the large central hole. This block is then moved rearward by the cam handle *C* and clamps the strip against the stationary block at the back of the fixture. Bending arms *D* and *E* are then swung around by means of the handles shown, bending both ends of the strip at right-angles.

The shape and direction of the bend at the lower end are easily controlled. The handles are hinged to the backs of the bending arms and are provided with pins as at *F*. With these pins locked in the holes *G*, the ends of the strips can be bent in or out by the projecting blocks *H*. These blocks, each controlled by handles as at *I*, are normally below the surface of the bending fixture, but have been raised so as to show their shape and purpose. With the side strip firmly clamped between the bending arms and the stationary block it it is an easy matter to bend the ends in either direction by simply raising the blocks *H* on each side of the strip and then swinging the handles in the desired direction.

A simple winding fixture for resistance coils or rheostats is shown in Fig. 2. Here the flat fiber strip *A* which forms the core is slipped into the block *B* with just enough projecting to fit into the rotating holder shown in the toolpost. The wire *C* comes from the reel at the back, being threaded through the strip of belt *D*, which acts both as a straightener and a brake, passes through the friction guide shown clamped to the steadyrest and is wound around the core at the proper pitch by having the lathe carriage geared to the lead desired. As the coil is wound, the core pulls out of the block *B*, the number of turns being controlled by the length of the core and the lead of the coil. The wire is then cut off and another core inserted in much less time than it takes to describe it.

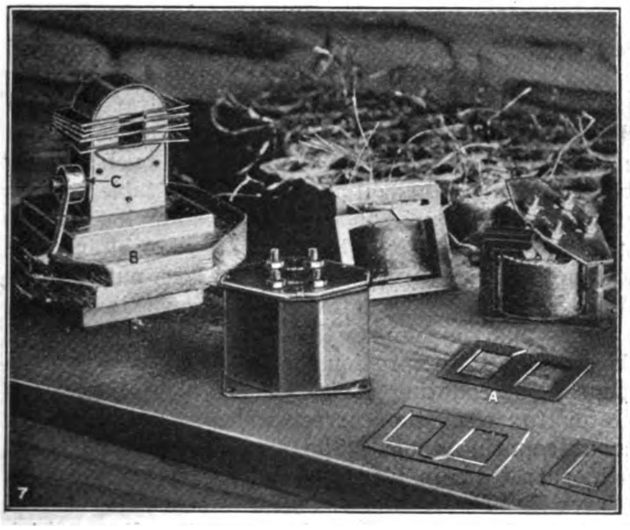
In addition to the rheostat and other coils, there are a large number of connecting wires necessary, some of which may be seen in Fig. 3. This illustration also shows some of the methods of bending loops and of locating them in the right place. The fixtures are very simple, the one at *A* making right-angle bends at any desired distance from the end, the location of the bend being controlled by a stop block. A sample board shows exactly the kind of bends desired and an experienced girl can turn them out very rapidly. The little fixture

B simply puts a kink in the end of the wire, at the desired point. At *C, D* and *E* are small, easily worked fixtures for bending loops in the ends of the wires.

Going from the rheostats and connecting wires to the making of the so-called basketball variometer, we find some extremely interesting methods. The basketball frame is made in halves from a sheet of thin fiber in which four holes have been punched in the corners for locating and carrying them under the punching machine as shown at *A* in Fig. 4. This machine has an indexing table of the usual type and the indexing mechanism is shown at *B*, *C* being a brake to prevent the rotating table from being carried beyond the proper point The completed spider or half frame is shown at *D*, while *E* shows the sheet just before separating the spider from it.

The frames or spiders then go to the winding machines shown in Fig. 5, where they are clamped by large washers as at *A*, that fit over the spherical fo ms and shape the arms of the spiders to conform with them. The spiders are then wound with insulated wire with a rapidity that is almost unbelievable when it is considered that the wire must go under one prong and over the next as the spiders revolve. The winding spindles are driven by small electric motors each controlled by a foot operated clutch and the girls become so expert that the winding is practically continuous. The wire comes up over the pulleys as at *B* and runs between the fingers of the girl's right hand as she guides it over and under alternate prongs. At the same time the finger of the left hand raises every second prong so as to have the wire slip under it easily. This is one of the best examples of what efficiency experts call "automaticity" that the writer has ever seen. The stacks of completed halves on the bench give an idea of their appearance.

The assembling of the halves into the complete sphere or basketball requires very careful riveting. Tubular rivets are used in the small machine shown at *A* in Fig. 6. Here it is necessary to insert the rivet, place the prongs over the anvil and bring down the plunger for each prong. As with winding, the girls become very



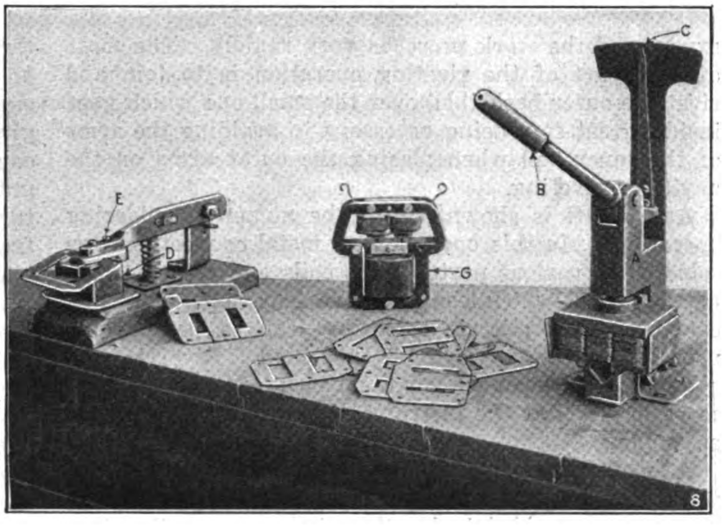


FIG. 7. ASSEMBLING A TRANSFORMER CORE. FIG. 8. ANOTHER ASSEMBLY FIXTURE

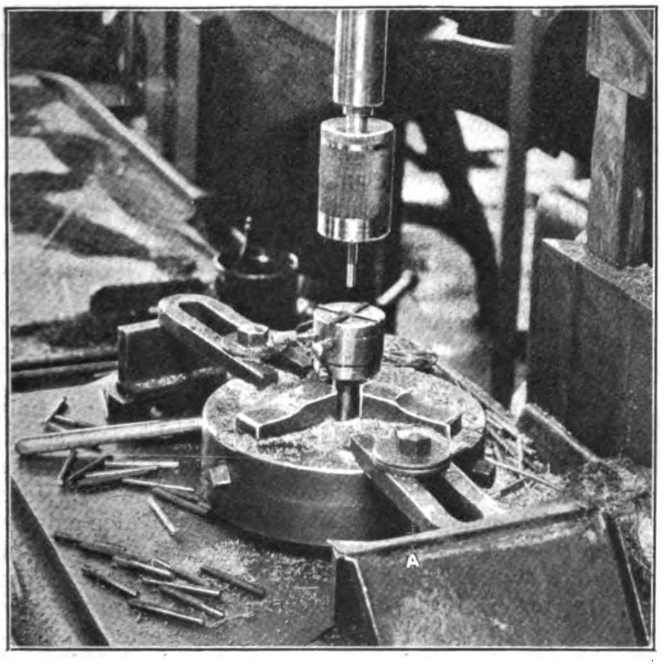


FIG. 9. THREADING STUDS IN A DRILLING MACHINE

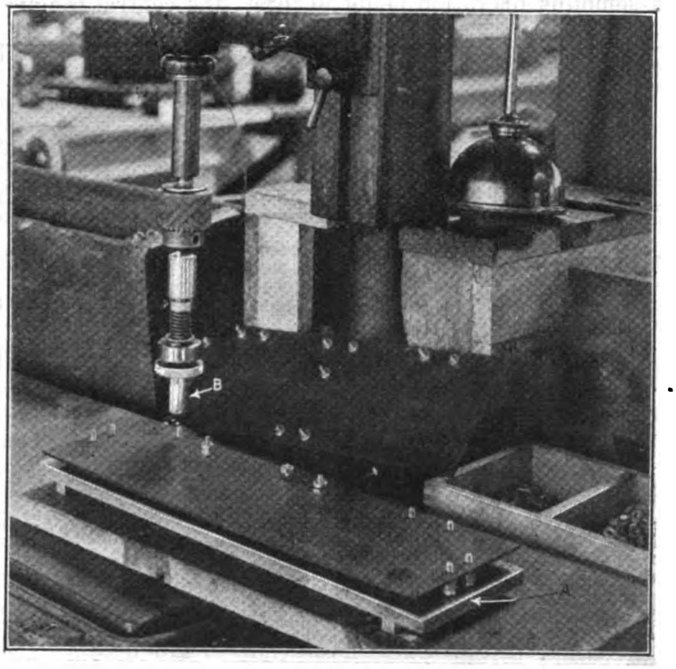


FIG. 10. ASSEMBLING AND STAKING BINDING POSTS

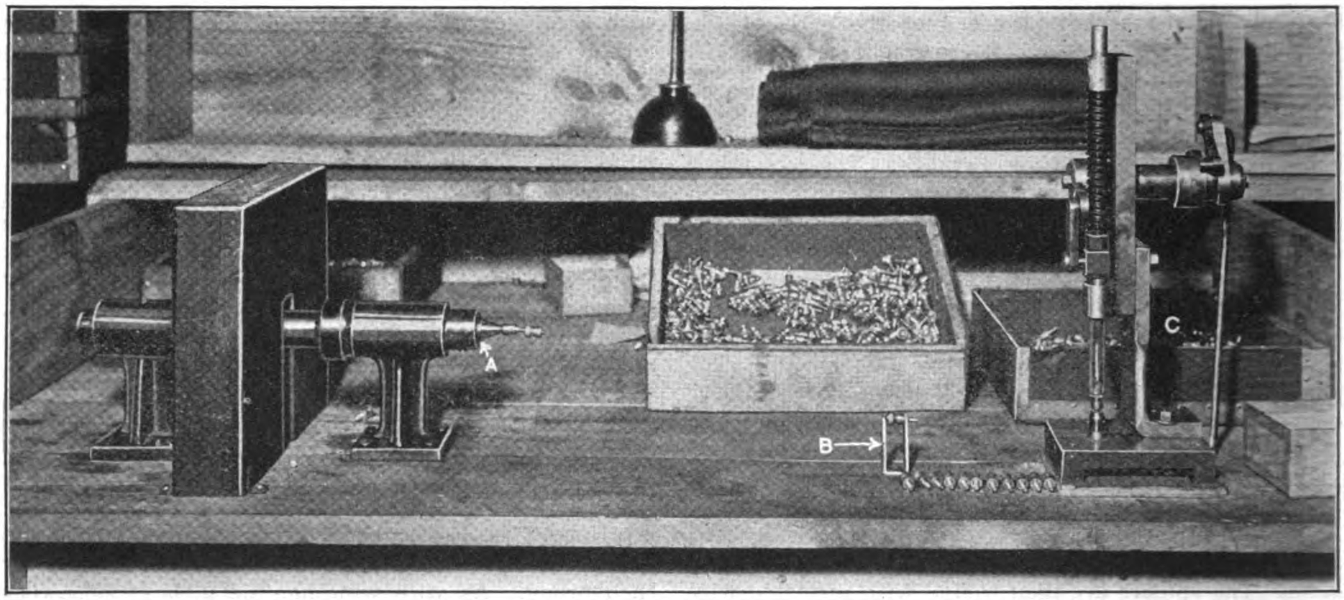


FIG. 11. ASSEMBLING STUDS BY POWER

expert and the work proceeds very rapidly. The most difficult part of the riveting operation is to join and rivet the outer basketball over the small one which goes inside, great care being necessary in avoiding the arms of the inner ball when placing the outer arms on the anvil for riveting.

At the left is shown one of the numerous soldering operations. In this operation all metal connections are soldered to various parts of the coils and also the connecting wires which lead to the various connections and controls. The electric soldering iron is particularly useful in delicate work of this kind. Several completed coils are shown on the bench and can be seen more in detail as the instruments progress toward final assembling.

A small transformer plays an important part in radio work and Figs. 7 and 8 show how the transformer cores are assembled inside the windings or coils. The shape of the stampings can be seen at *A*, Fig. 7, the assembling operation being to insert the central tongue through the opening in the coil. The coil is mounted on the revolving table *B* and held in place by a thin sheet-metal strap over the top and clamped at *C*. The girls bring the central tongue of a stamping so that it can be entered through the opening, and push it over until it surrounds the coil as shown. The table is then turned halfway round and the next stamping put in from the opposite side. The stampings are alternately placed until the required number have been put in.

Another form of transformer is shown in Fig. 8, the stampings which form the core being very similar in both this and the previous case. This view shows a measuring or counting device at *A*, which enables the operator to select the correct number of stampings without counting them. She simply gathers a small bunch, puts them in place as shown and brings down the lever *B*. The pointer *C* indicates when the correct amount has been secured. There are two lines which give the upper and lower limits permissible in each core.

When the correct number of stampings have been selected, they are threaded into the core in a very simple manner as explained in connection with Fig. 7, except that they are all inserted in the same direction, which obviates the necessity for the revolving table. The core *D*, Fig. 8 is clamped in position by the lever *E*, which is operated by foot pressure and locked in position by suitable notches. With the core held firmly in position, the stampings are threaded through, the upper ends sliding over the sheet-metal protector attached to the clamping device. In this way the core is readily put in place inside the coil and is ready to be connected in the frame shown at *G*.

Work of this kind requires a larger number of studs and in order to prevent tying up an automatic screw machine, they are being made very successfully in the single-spindle drilling machine shown in Fig. 9. Here a Gronkvist chuck is put in the drilling machine spindle and a Geometric self-opening diehead is held in a three-jawed chuck, which in turn is clamped to the drilling machine table. The operation is practically continuous as the brass rods can be inserted and removed from the chuck without stopping the spindle and the self-opening diehead obviates the necessity for

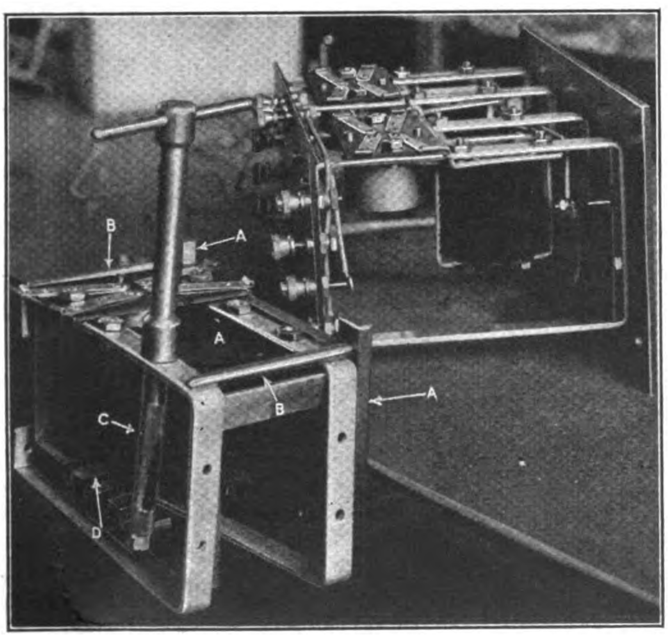


FIG. 12. AN ASSEMBLING FIXTURE FOR UNIT FRAMES

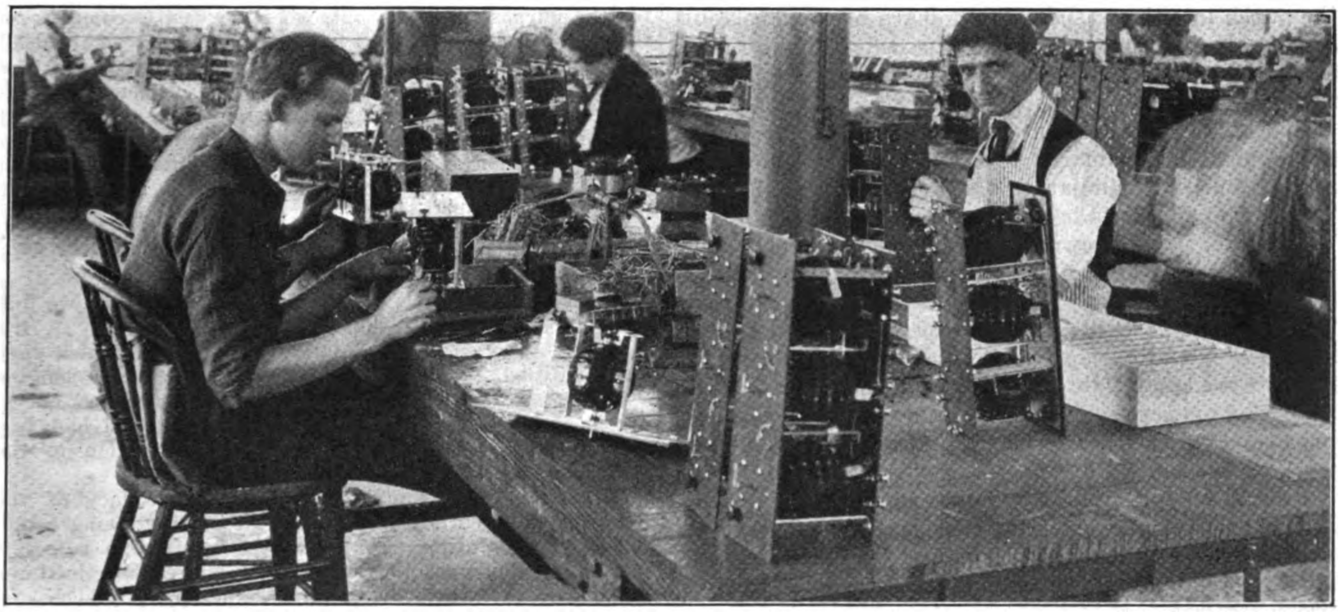


FIG. 13. ASSEMBLING OPERATIONS ON THE COMPLETE UNITS

reversing the spindle. The studs are threaded very quickly in this way and by placing them on the chute *A* they fall directly into a box which prevents iu ther handling until they are ready to be taken to the next operation.

The assembling of small parts can easily consume an inordinate amount of time. It also affords opportunity for many ingenious devices, one of which is shown in Fig. 10, where connections are being fastened to an insulated panel that belongs in front of a combination of three separate units. The screw connections that have previously been assembled are placed in bushings in the plate *A*. Each bushing has a c ossbar which engages a slot in the end of the stud and holds it from turning. The panel is then put in position over the studs, a nut is slipped in the friction chuck *B* and the panel moved to bring it in the proper position. Each rut is driven home with the same tension, the clutch slipping as soon as it has been put in place.

In Fig. 11 is shown the way the studs, which are really binding posts, are made ready for assembling. The thumbnut and washer are screwed on by means of the power-driven head at *A*. The head of the stud is held by friction and the two parts screwed into place very rapidly. The gage for measuring the proper location of the threaded washer is shown at *B*. When the washer is correctly located, it is staked in position against turning by means of the little machine at *C*. This machine is in reality a large automatic center punch in which the staking is done by a hollow punch with four prongs that surround the stud and rest on the underside of the threaded washer. The pressure on the pedal compresses a spring and, at the proper point, releases a trip so that the spring drives

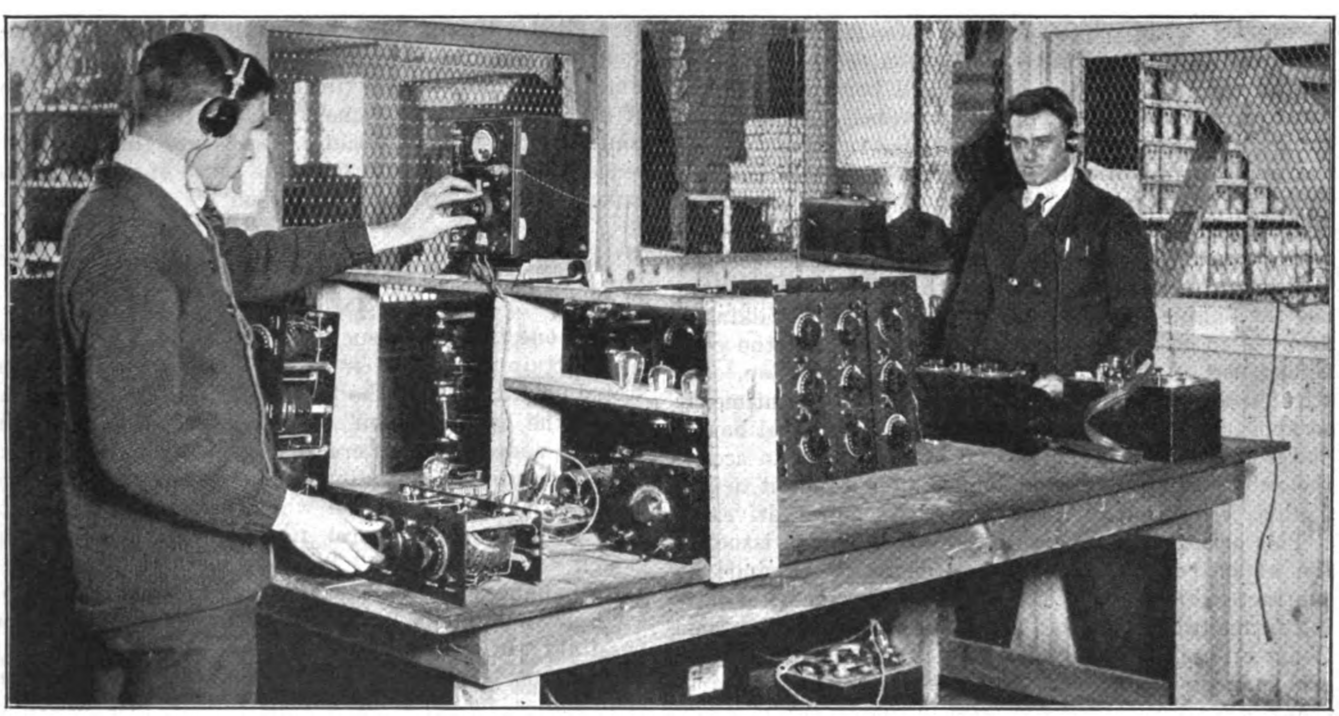


FIG. 14. GIVING EVERY UNIT ITS FINAL TEST

the punch into the washer with a sharp blow. The four prongs already mentioned stake the metal so as to grip the binding post stud firmly and prevent them from turning.

In Fig. 12 is to be seen the assembling of one of the units consisting primarily of a frame of two aluminum strips somewhat similar to the one shown in Fig. 1. This strip happens to be for a vacuum tube detector, the lamp socket being shown in the unit on the bench. The assembling frame is illustrated at *AAA* and includes two rods *BB* under which the framework is slipped. The screwdriver *C* fits into any one of the slots of the fixture at *D* and holds the screws against turning while the nuts are being tightened in place by the socket wrench shown. This screwdriver is easily moved from place to place and affords a convenient method of assembling work of this kind.

In Fig. 13 the units are shown approaching completion at one of the assembly benches. The basketball variometers are much in evidence here, as are the aluminum frames shown in Fig. 1 and the branch wires previously referred to.

After the complete assembly every unit is thoroughly tested, some of the tests being shown in Fig. 14. These tests check up all the work previously done, and insure the apparatus being in working condition when it leaves the plant. Many new developments are on the way, and improvements are to be expected from time to time. But with the units designed and constructed as illustrated herewith, changes and additions can be readily made to keep pace with future developments.

Use After Rejection Constitutes Acceptance by the Buyer

By Leslie Childs

Purchasers of machinery, under sales contracts in which provision is made for a definite trial period, will do well to bear in mind a decision recently handed down by the Wisconsin Supreme Court in the case of Fox vs. Wilkinson, 133 Wis. 337.

Fox, the plaintiff and buyer in the case, entered into a contract with Wilkinson, the defendant and seller, to purchase from the latter a traction engine. Wilkinson agreed to take $400 and an old horsepower drive for the engine. The contract provided, among other things, that Fox was to have ten days in which to test the engine. Upon delivery, Fox used the engine on some six or seven different days; decided, finally, that it was defective; that he would not accept it, and served notice upon Wilkinson to that effect. After notifying Wilkinson, however, it appears that Fox continued to use the engine for about a day and a half. Wilkinson declined to accept the rejection, claiming that the continued use of the engine by Fox, after rejection, constituted an acceptance. Wilkinson, in the meantime, it so appears, had been given possession of the old horsepower drive. Upon the refusal of Wilkinson to accept the rejection by Fox, Fox immediately brought action against Wilkinson to recover the horsepower drive.

This action on the part of Fox brought into issue, at the outset, the question of his right to rescind the contract in the light of his use of the engine after having formally rejected it. The case reached the Supreme Court on appeal, and that body, laying down the general rule governing cases of this kind, said in part:

When a purchaser has the right to subject the article to trial, the mere use is, of course, ambiguous, for it may be for the purpose of trial; but, when the test is complete so that the purchaser has, to his satisfaction, ascertained all that trial can teach him, and determined that the article does not satisfy the contract, then that element of ambiguity is eliminated in the construction of any subsequent acts of dominion or use. After that certainly any unnecessary application of the article to his advantage and benefit would in honesty be consistent only with a decision to become or continue owner. . . .

Reviewing the facts in the case and applying the general rule thereto, the court said:

Applying these rules of law to the instant case, we find it established as fact that, about noon of Aug. 27, the plaintiffs (Fox) had so completed the trial to which they were entitled, that they had ascertained that the engine would not work as guaranteed, and had determined not to accept it as satisfying the contract of sale, and had forwarded notice of such defect and determination to the seller. . . .

The trial being complete, and the inadequacy of the article to fully satisfy the calls of the contract being established, the plaintiffs (Fox) had the election to reject it altogether and rescind the sale, or, in certain business exigencies, to retain it as of some value, and pay such sum as might be proper after due allowance for its defects. . . .

In this situation, and with this right of choice, they made use of the engine for their own benefit for the remainder of the 27th and until noon of the 28th of August. There is no proof of any special exigency rendering such use unavoidable. Under authority of our decisions, such acts can have but one construction. They must be deemed to unambiguously declare plaintiff's (Fox) election to become owners. . . .

The court concluded by affirming the judgment rendered in the lower court in favor of the sellers (Wilkinson), holding that the use of the engine after its rejection by Fox constituted, in effect, an acceptance.

This decision should serve as a warning to the prospective purchaser of equipment. If a purchase contract be entered into, its terms and provisions must be respected to the letter by both parties. If the article or piece of equipment purchased prove unsatisfactory during a definite trial period, formal written notice of rejection should be served upon the seller by the buyer. Failure to observe this important point may be held to constitute an acceptance, as has been shown in the case here cited. If, for any reason the trial period agreed upon be found of insufficient length, and extension of time be desired, such extension should be taken care of in a separate agreement in writing between the contracting parties. Failure to observe this commonsense rule has been, too often, the cause of unwarranted expense and disagreeable litigation.

Orders vs. Instructions

By C. E. Jenson

It is one thing to issue an order to do a certain job in a certain way, another to show how to perform the stated operation with the proverbial skill and despatch, or "to the Queen's taste" as the saying still goes. In fact, if some orders were unaccompanied by instructions they might appear impossible to carry out. (Some are.) That method is best which instead of just emitting an order in general terms, like "make six to sketch and dimensions," dictates just what machines and appliances are to be used, and to what degree of accuracy and finish, which if it does not obviate the possibility of wrong work, at least lessens it and (if instructions are followed to the letter) places the responsibility for total or partial failure just where it undoubtedly belongs—on the one issuing the order.

Distortion Produced in Casehardening

Consistent Minimum Warpage in Manganese Steel—Large Holes Decrease, Small Holes Increase when Carbonized—Greater Wall Thickness Produces Greater Effect

By A. A. BLUE
Metallurgist, Duff Manufacturing Co.

IN THE manufacture of casehardened gears, ratchet wheels and bushings, which involves comparatively small center holes that must be subsequently ground to fine tolerances, it was a difficult matter to predict the size the holes should be made before carbonizing and hardening so as to properly allow for the grinding. The following experiments were undertaken, therefore, to arrive, if possible, at some generalization in this regard.

It was felt that the most significant variables to be considered were: The grade of steel used; the size of the opening as compared with the diameter of the entire piece, i.e., the wall thickness; and the nature of the opening, as round, square, hexagon.

The steels met with in the manufacture under consideration were S. A. E. 1,020, S. A. E. 1,114 and a low-carbon, high-manganese steel, all, of course, being carbonized. The analyses of the samples used in the present tests were as follows:

	Carbon	Manganese	Phosphorus	Sulphur	Chromium
S.A.E. 1,020......	0.26	0.54	0.015	0.044	....
S.A.E. 1,114......	0.18	0.67	0.068	0.084	....
Manganese steel...	0.21	1.14	0.020	0.039	0.22

Disks 1 in. thick by 2½ in. in diameter were prepared from each of these steels, and openings cut in them as follows: 2-in. round, 1½-in. round, 1-in. round, ½-in. round; and 1½-in. hexagon, 1-in. hexagon, ½-in. hexagon. Thus a variety of wall thicknesses and two shapes of holes were given. The openings were then carefully measured by means of a micrometer and the results noted in the accompanying hole dimension table. The location of each measurement was marked by punch marks, so that all later measurements could be made at the same point, thus eliminating any variation in the piece itself.

Casehardening the Samples

All pieces were well packed in carbonizing boxes, heated throughout to 1,650 deg. F. and held at this temperature for 4 hr. After this, the pots were removed from the furnace and allowed to cool on the floor. The disks were taken out when cold and the openings were again measured at the same location as the measurements made before carbonizing.

The disks were then reheated to 1,600 deg. F. in a lead pot, to prevent scaling, and quenched in oil, after which they were cleaned and measured as before. Finally, they were reheated in the lead pot, the manganese steel to 1,375 deg. F. and the others to 1,425 deg. F. and quenched in water, once more cleaned and measured. The figures obtained by the measurements in these three operations are given in the hole dimension table.

The outstanding feature of the results was the marked and consistent minimum warpage found to occur with the manganese steel. Practical work in carbonizing a steel of this manganese content has shown it to deform in treatment to a markedly less degree than ordinary carbon steel. The present experiments indicated that S. A. E. 1,114 steel, or ordinary screw stock, came close to the manganese steel in this respect, although, of course, its high sulphur and phosphorus contents render it unfit for good carbonizing practice. This effect, in the case of the S. A. E. 1,114 grade may have been due to the fact that the steel was dead as a result of these large amounts of impurities, so that it had less strength than the purer S. A. E. 1,020 steel, and, therefore, it had less power for distortion. Such an explanation, however, will not apply in the case of the manganese steel, where the tensile properties are greater than those of the ordinary carbon steels.

HOLE DIMENSIONS PRODUCED IN CASEHARDENING

Sample	Machined	Carbonized	Oil-quenched Center	Oil-quenched Edge	Water-quenched Center	Water-quenched Edge
Round hole, 2 in. dia.,						
1,020......	2.001	2.000	2.000	2.004	1.998	2.000
1,114......	2.002	2.001	2.000	2.001	1.999	2.001
Manganese	2.001	2.000	1.996	1.999	1.997	1.999
Round hole, 1½ in. dia.,						
1,020......	1.502	1.501	1.494	1.502	1.495	1.500
1,114......	1.503	1.502	1.500	1.502	1.501	1.502
Manganese	1.501	1.500	1.500	1.501	1.498	1.500
Round hole, 1 in. dia.,						
1,020......	1.001	1.001	0.998	1.004	0.991	0.998
1,114......	1.000	1.000	1.000	1.002	0.997	1.003
Manganese	1.001	1.001	0.998	1.002	0.999	1.001
Round hole, ½ in. dia.,						
1,020......	0.499	0.500	0.492	0.497	0.487	0.498
1,114......	0.499	0.500	0.496	0.500	0.496	0.500
Manganese	0.499	0.500	0.499	0.500	0.500	0.501
Hexagon hole, 1½ in.,						
1,020......	1.503	1.502	1.499	1.505	1.498	1.503
1,114......	1.503	1.502	1.502	1.504	1.503	1.503
Manganese	1.503	1.502	1.502	1.504	1.500	1.501
Hexagon hole, 1 in.,						
1,020......	1.002	1.002	0.993	1.001	0.994	1.003
1,114......	1.001	1.001	0.999	1.002	0.998	1.002
Manganese	1.001	1.002	1.001	1.003	1.002	1.005
Hexagon hole, ½ in.						
1,020.....	0.564	0.564	0.556	0.564	0.556	0.566
1,114......	0.563	0.564	0.562	0.565	0.560	0.564
Manganese	0.564	0.564	0.564	0.567	0.563	0.566

The changes in the diameter of the openings for the various steels as a result of carbonizing only are given in one column of the hole dimension table. It appears to be consistently brought out that the larger holes got smaller, while the smaller ones got larger, although the change in any case was small. This may have been due to the greater expansive forces present in the thicker walled pieces, or it may have been because the smaller holes offered poorer conditions for the absorption of carbon, and hence showed no growth in thickness. This effect is apparently independent of the grade of steel or the character of the opening.

Generally speaking, the greatest change came after the second hardening and although the differences in the effects of the two hardenings were small in the case of hexagons, they were quite large for the round holes. The S. A. E. 1,020 steel showed the greatest changes, the S. A. E. 1,114 grade the next and the manganese steel the least, although these latter two were frequently very close together, as noted above.

It was seen that the changes got smaller as the size of the opening increased, or, in other words, as the wall thickness decreased, and it was apparent that the thinner sections had less distorting power than the thicker ones. This effect was found to be true both for round and hexagonal shaped openings.

In measuring the openings in the samples after hard-

ening, it was found that the interior of the holes were smaller than the outer edges. These two sets of figures are given in the hole dimension table under the headings "Center" and "Edge" respectively for each hardening operation. The difference between these two figures, or the "bulge" was greater with the smaller holes, that is, the greater the wall thickness the greater was the distortion, due, no doubt, to the greater forces exerted by the larger mass of metal. The distortion in this connection was also greatest with the S. A. E. 1,020 steel, the S. A. E. 1,114 grade being second, and the manganese steel again showing the least deformation. All of the specimens showed a scleroscope hardness of from 80 to 85 after water quenching.

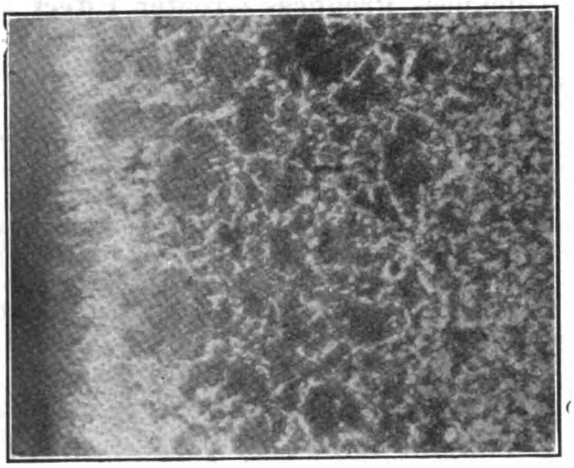


FIG. 1. MICROPHOTOGRAPH, S. A. E. 1,020 STEEL
At 100 diameters, 5 per cent HNO_3 etch. Shows case with good penetration. Separation of ferrite in case is due to annealing for machining. Core has fine grain.

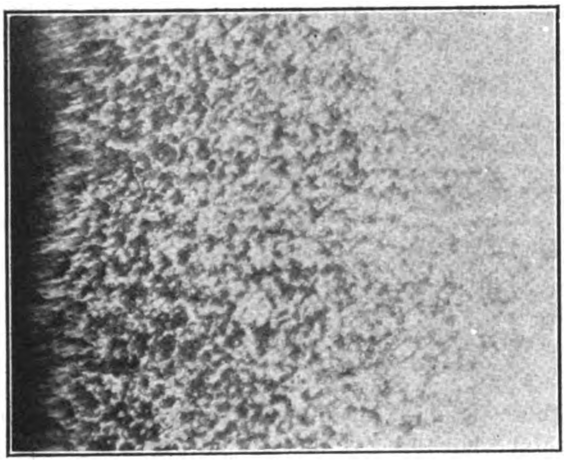


FIG. 2. MICROPHOTOGRAPH, S. A. E. 1,114 STEEL
At 100 diameters 5 per cent HNO_3 etch. Shows case with rather light penetration and marked evidences remaining of segregation in streaks, even after having received four heats. The light case obtained with this grade of steel may have some bearing on the small amount of deformation produced in hardening.

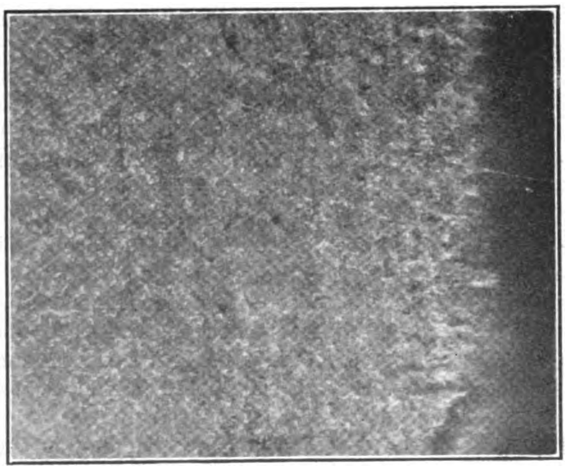


FIG. 3. MICROPHOTOGRAPH, MANGANESE STEEL
At 100 diameters, 5 per cent HNO_3 etch. Shows outer portion of case. The remaining inner portions of the case extend considerably beyond the range of the lens of the microscope and could not be included in a single photograph. Note great density of case even after annealing operation. In spite of much greater depth and density of case, this grade of steel was found to show the least distortion upon hardening.

After the final measurements had been taken, one sample of each grade of steel was annealed, cut so as to show the case, polished, etched with alcoholic nitric acid, and photographed at 100 diameters. The results are shown in Figs. 1, 2 and 3, and are the representation of the S. A. E. 1,020, S. A. E. 1,114, and manganese steels. In all of these photographs, the carbonized case is shown at right-angles to the direction of rolling in the original bar. The difference in penetration of carbon into the various steels is marked and well worth noting. It should also be observed how the segregation and streaks in the S. A. E. 1,114, or screw stock, persist even after the four treatments the steel has had up to this point. These streaks run out into the case and frequently tend to form soft spots in carbonized material made from this grade of steel.

The conclusions formed from these tests are that:

The character of the steel plays the greatest part in determining the amount of distortion to be expected after final hardening in the casehardening operations. The addition of manganese up to approximately 1.25 per cent to ordinary S. A. E. 1,020 steel reduces the deformation to a very marked degree. Where its other properties are not objectionable, screw stock will be found to show only a small amount of warpage.

The wall thickness of the piece under consideration plays an important part in the deformation after treatment, the greater wall thickness producing the greater effect.

The shape of the opening in the piece, judging from the comparisons made of round and hexagonal-shaped openings has no marked effect.

Understanding Shop Terms

By Robert Grimshaw

In many lines of industry, terms are used that are almost or entirely unknown in other branches. On the other hand some expressions mean one thing in one line and something entirely different in another. I was 23 years old before I met up with the word "shim," which is New Englandese for a thin wedge or packing-out piece. In Wilmington and Chester and Philadelphia, we had (very properly) called it a "Dutchman"—because that was its right name.

In some shops "chucking" is merely putting work pieces into and holding them in a chuck, while in others it implies processing in a turrent lathe or its equivalent. The "universal wood worker" of Cincinnati becomes a "general jointer" when transported to London, where our monkey wrench is known as a "universal spanner." What the New York clothing manufacturers know as a "mark" the Baltimorean terms a "spread."

It is evident that the foreman must know the local trade terms—and then some—and see to it that his workmen, many of whom come from parts more or less unknown, know them, too.

Second-Story Planer Foundations

How the American Tool Works Supports Its Planer Department Upstairs—Concrete Slabs for Foundations—Methods of Leveling and Straightening Long Planer Beds

By A. E. ROBINSON
General Superintendent, American Tool Works Co.

WHILE many machine shops are in multi-storied buildings and consequently have machine tools of various kinds on floors above the street, it is not often that we find the whole planer department of a large plant, including some large machines, located on the second floor.

The installation of the twenty-five planers in the planer department of the American Tool Works Co., Cincinnati, Ohio, is unique from several standpoints, the principal feature being the fact that the machines are installed on the second floor of a reinforced-concrete building, and within a space approximately 80 x 220 ft. A partial view of the planer department is shown in Fig. 1. Five rows of machines are placed with ample aisle space between the rows and storage space between the machines. Special cranes with electric hoists are mounted on the ceiling over the loading ends of the tables and permit of loading any planer without disturbing the others.

Many of the machines are provided with variable speeds for cutting, with a constant return speed. All the planers except one are belt-driven from line shafts driven by motors through silent chains. On machines having variable cutting speeds, a single belt from the line shaft is used to drive the return pulley on the countershaft, while a variable-speed motor on the ceiling is used to drive the cutting pulley through a silent chain, the speeds being controlled through a rheostat on the bed near the tumbler lever. The remainder of the machines have two-speed countershafts driven by belt from the line shafts.

The largest planer is 72 in. x 60 in. x 40 ft. and is arranged for reversing motor drive. This planer is equipped with three rail heads and two side heads, and will plane eighteen small lathe beds at one setting.

The installation of this machine and the other smaller machines on the second floor was a problem that required study and differed materially from the customary installations on ground floors or solid foundations.

It was found that the use of a raised concrete foundation on top of the 10-in. floor slab would provide the necessary beam construction to stiffen the floor and prevent vibrations in the machines. But on account of the excessive weight of the 72-in. x 40-ft. planer, together with its table loads, it was deemed advisable to place an auxiliary supporting column directly under the center of the planer near the housings. The form for this column was placed in position and the reinforcing rods and concrete were introduced through a hole in the floor above.

The same type of foundation was used under all the planers, but the 72-in. machine, being so much larger than the others, makes its foundation construction of greater interest and it will therefore be described in detail. The first thing to be considered was the exact location of the machine with reference to the adjacent columns, and to obtain the maximum rigidity of floor by keeping it close to the columns, which have mushroom tops 8 ft. square. These columns are spaced 20 ft. apart in each direction and a liberal use of reinforcing steel in the columns and floor slab effectively ties the parts together in a very rigid mass.

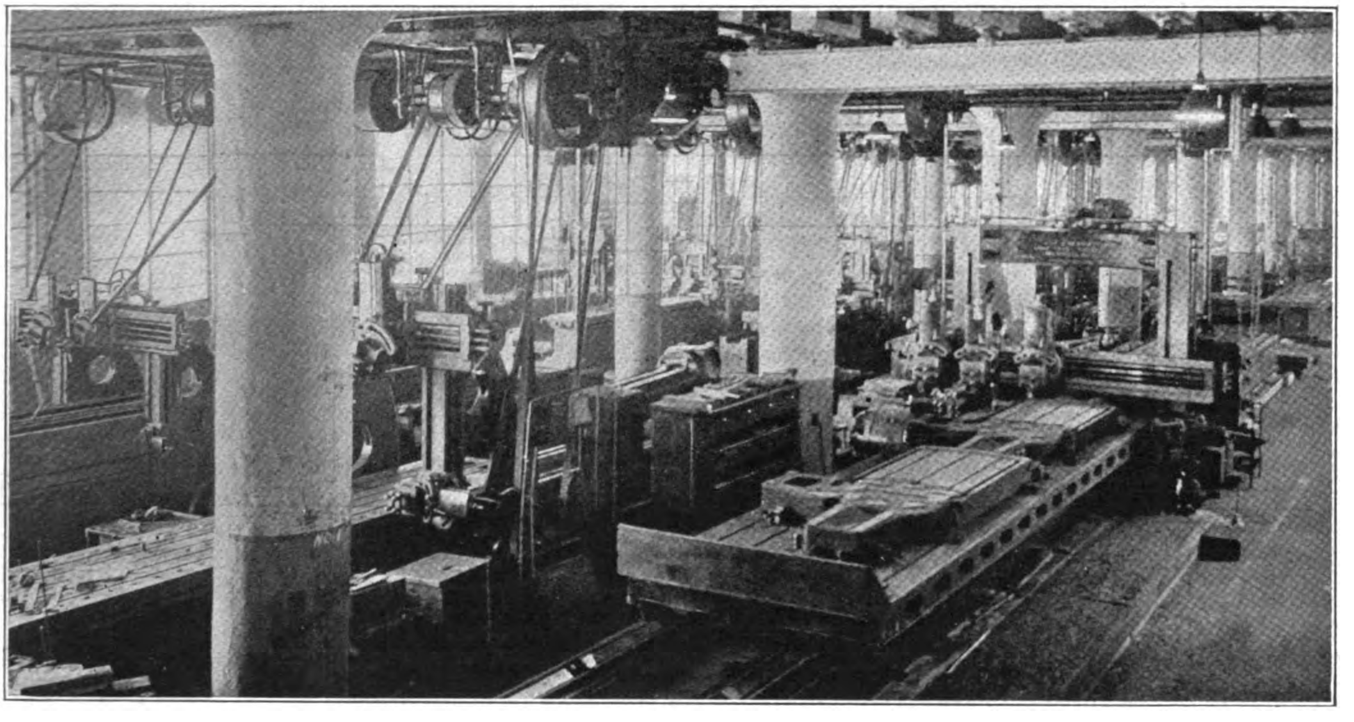


FIG. 1. SECOND-STORY PLANER DEPARTMENT

The plan and elevation of the foundation and a section through the building at this point are shown by Fig. 2.

The floor was carefully cleaned and all oil or other foreign substances removed, then the surface was roughened to hold the concrete of the foundation. The wooden form for the foundation was built on the spot, carefully located from chalk lines laid out on the floor, and firmly anchored in place by braces from adjacent columns and machines. Heavy castings were laid on the form at intervals.

The use of jacks for leveling planers is universal in this plant, and the principal consideration in this instance was the number and location of these devices. The depressions for them were cast in the foundation by inserting a frame across the form at their locations and the omission of concrete inside these frames. The concrete was, however, firmly tamped under these frames.

The concrete projected outside of the planer bed about 4 in. all around, with some additional width at the ends and with housing seats to accommodate a special combined jack and locating device of the double-screw type.

The jacks consist of a main baseplate ribbed on the bottom so as not to slip. Upon the baseplate slides a wedge block controlled by a heavy screw at the outer end. The special fixtures include another heavy screw in an upturned flange to bear against the bed and prevent any side or longitudinal motion. The two special fixtures at each end of the bed were placed crosswise, while the four used at the housings were placed longitudinally, holding the machine firmly and preventing any movement on the wedge blocks.

After the concrete form was in place a number of twisted reinforcing rods were suspended in it to tie the members of the foundation together firmly. Then thin concrete was poured into the form and carefully tamped and settled at all points, and a trowel used all around the outside to bring the cement to the outer surface. Slicing the trowel up and down inside of the form to force away the gravel insured a smooth surface.

The form was allowed to remain on the foundation for about a week, then it was removed and the outer surface "pointed up" where necessary.

After the main foundation was firmly set the leveling jacks were carefully located and leveled, then a thin cement grout was poured around each jack base to anchor it securely in the depression of foundation. After the cement around the jacks had hardened the planer bed was placed upon the jack blocks and carefully aligned and leveled by the process to be described.

The leveling and aligning are two separate processes, although each is somewhat related to the other. The leveling was done first, then the alignments were made and, after that, a final check-up of the leveling.

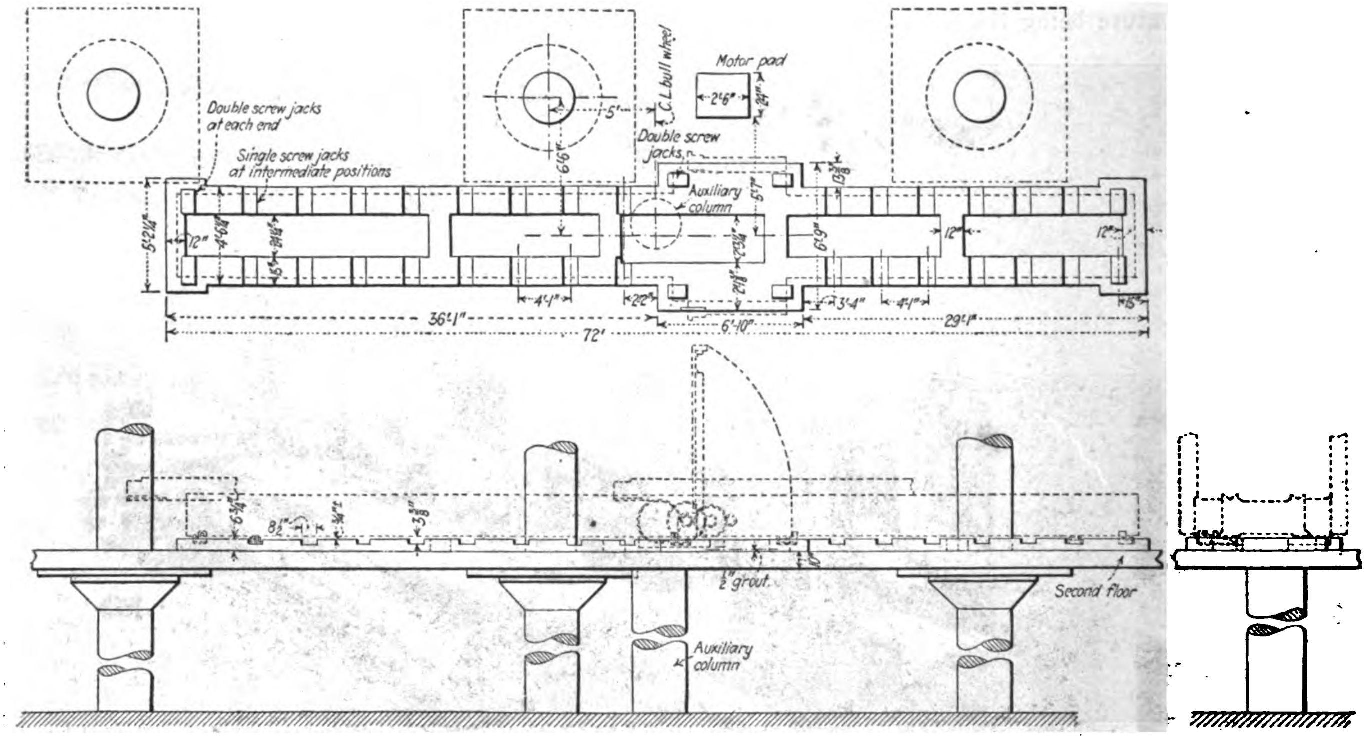


FIG. 2. FOUNDATION AND SUPPORTING COLUMNS

To level the bed the table was run to the extreme end of the bed, and six ground cylinders all of the same diameter laid in the V's. Across the cylinders were laid three tested parallel bars of the same thickness and then another parallel bar laid longitudinally on these parallels to hold a graduated level and a straight-edge.

The leveling was started at one end and the wedges of the leveling jacks set up or down as required, adjusting them at both sides of the bed. Then the first parallel was removed and placed in front of the third parallel, and the level bar and straight-edge moved forward, using the two previously leveled parallels as a gaging point. The jacks under this portion were then carefully set and the process repeated until the opposite end of the bed was reached. The straight-edge and level were also used in a diagonal direction, and the level used crosswise on the lower parallels.

After the first leveling was completed the bed was checked for alignment, the method and apparatus being as follows:

The aligning was performed by the use of a tight piano wire and an indicator. The wire was stretched between two uprights, one at each end of the bed. The

uprights were mounted on duplicate V-blocks which fit the bed V's. The indicator was mounted upon a third V-block which slides along the V of the bed. The indicator was used to take a reading between its end and the wire to determine the amount of mis-alignment at all points of the bed.

A piece of white paper was laid under the wire and

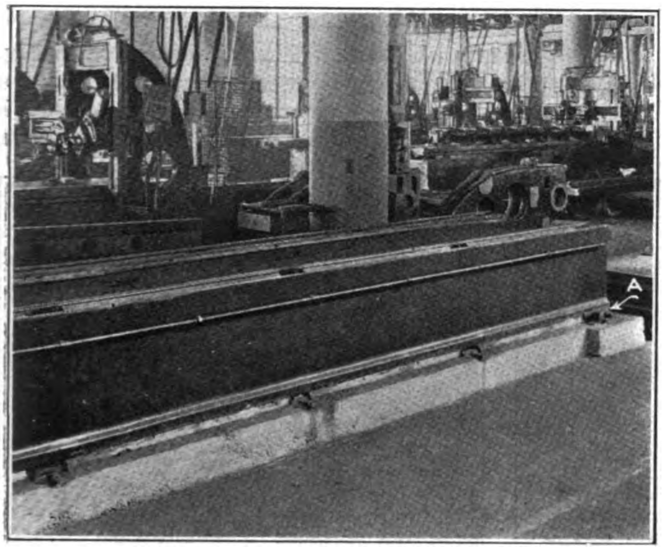


FIG. 3. LARGE PLANER FOUNDATION AND ALIGNING JACKS

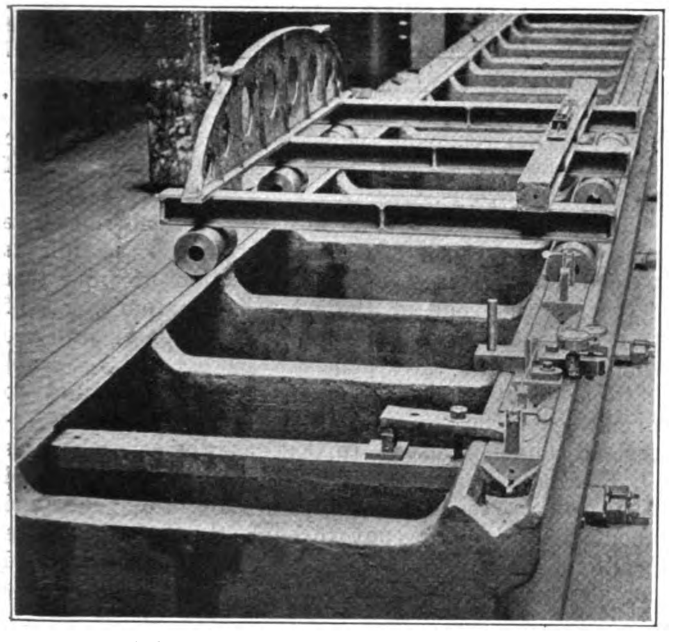


FIG. 4. LINING UP AND LEVELING THE PLANER BED

an electric light with a shade on it used to illuminate the paper, thus permitting the light space between the wire and the indicator to be clearly seen.

Forcing the Bed Into Line

The alignment began at the housings and worked both ways, as the ends of the bed could be easily moved with a crowbar, while the housing section was too heavy to move and formed a good starting point. In place of a crowbar, however, a special device *A*, Fig. 3, with a screw in the side to move the bed sideways, was used.

The indicator was set up to the wire at the middle point of the bed, then it was moved to each end and the reading at the middle duplicated by shifting the ends of the bed to suit. Then all the intermediate points were checked and after the entire length had been covered in this manner a final check up was made to insure against errors.

After the alignment, a final level reading was made, the table placed on the bed and a very light cut taken over the table top.

Finally a narrow board was secured all around the inner and outer edges of the bed and the space between the under face of bed and foundation was filled with a cement grout. After all settling and drying out of cement had ceased, the small pockets cast near each jack were filled with melted sulphur. These sulphur pads assist in supporting the bed and relieve the strains from the jacks somewhat, and because sulphur sets without shrinking it maintains a solid bearing between bed and foundations.

Leveling and Aligning the Planer Bed By Well-known Method

The illustration, Fig. 4, shows in a preliminary way the method used in leveling and aligning the planer bed. This method has been in use for about 20 years by the American Tool Works, the photograph having been taken many years ago.

As concrete requires quite a length of time to harden, it is necessary to check up the leveling of the bed at frequent intervals until no movement is detected, then an occasional check up is all that is necessary to insure accuracy at all times.

This planer installation has now been in use constantly for about five years, and has proved entirely satisfactory and free from the chatter annoyances which we might expect to find in an installation of this nature.

Does Forced Lubrication Score Bearings?

By Frank C. Hudson

MANY of the best automobile motors have forced lubrication for the crankshaft bearings and we have always supposed that this was the way to secure the surest and best lubrication of bearings. It certainly sounds reasonable, but there's another side to the story.

A friend of mine runs a real service station where he re-turns and sometimes re-grinds crankshafts. He tells me that his crankshaft man would starve to death if it were not for the motor with forced feed. Journals in such motors are almost always scored opposite the oil hole in the bearing. Crankshafts with splash feed are rarely found to be scored and a little polishing is all they need unless they have worn out of round.

If this is so, and I've no reason to suppose my friend is incorrect, it seems to indicate that the forced lubrication system pumps grit of some kind, as well as oil, into the bearings. With the splash bearing the grit evidently does not get in between the bearing surfaces.

The scoring can only be caused by dirt which gets into the oil and stays there. It shows that it pays to change the oil in the crankcase frequently so as to keep the oil clean. A few quarts of oil are cheaper than a motor overhaul. New oil every 500 miles is a good investment.

Automotive Service Methods and Equipment

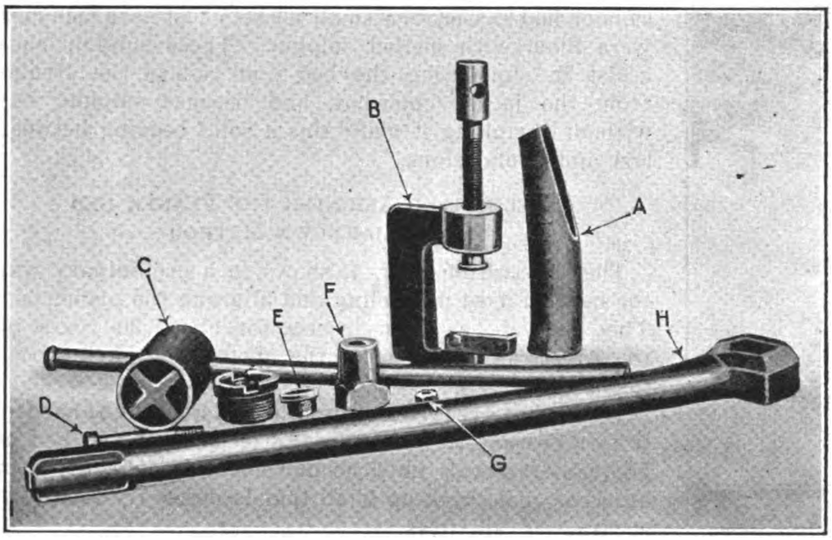
XII. Service Operations on the World's Largest Motor Car Fleet—Tools for Assembling and Disassembling—Straightening the Frame

By HOWARD CAMPBELL
Western Editor, *American Machinist*

THE Yellow Cab Co., of Chicago, Ill., owns and operates nearly 1,500 taxicabs—probably the largest single fleet of motor vehicles in the world. These cabs were designed especially for this service by the Yellow Cab Co.'s engineers, working in conjunction with the engineers of the Continental Motors Co., the Timken Axle Co., the Brown-Lipe Gear Co., and the several other companies that manufacture the major parts of the assembly. One of the main features of the design is that of accessibility for service. Some of the service tools used are described herewith.

The tool shown at *A* in Fig. 1 is a 9-in. section of 1½-in. pipe that has been milled or ground at an angle across the end and down the side, the two surfaces thus machined forming a right-angle. This pipe is used as a punch with which the steering wheel is driven off the end of the shaft. The upper end of the pipe is placed against the shaft just under the wheel, so that the pipe partly envelops the shaft and with the upper end of the pipe bearing half way round the under side of the hub of the wheel. Then the wheel can be driven off as a rule with little, if any, injury resulting.

The section of pipe just described can be used for driving off wheels that have cast-iron spiders, but is hardly practicable for use on wheels with aluminum spiders. For removing the latter from their shafts, the puller shown at *B*, Fig. 1, is used. The operation of the tool is obvious.



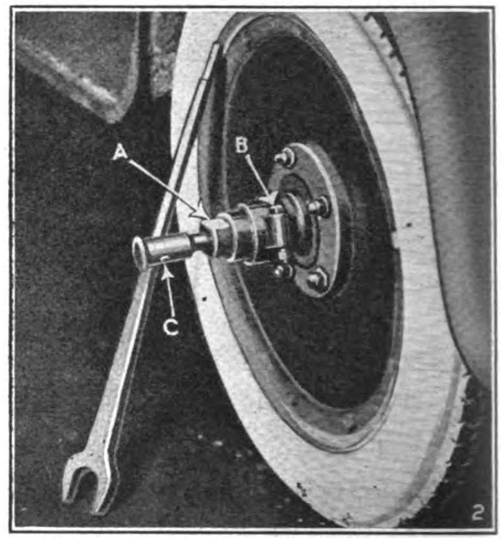
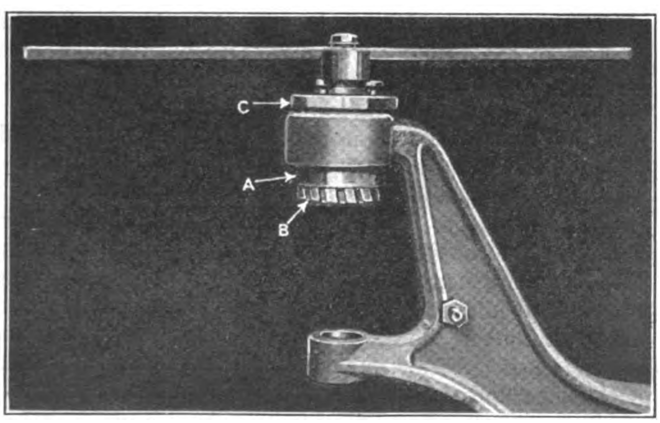


FIG. 1. A FEW HANDY SERVICE TOOLS. FIG. 2. WHEEL PULLER IN POSITION

The wrench shown at *C* is used for removing valve plugs from cylinders. A spider-shaped section is welded into the bottom of the section of pipe that serves as the body of the wrench, the four arms of this spider being of the correct width to fit into the four slots in the valve plug.

Occasionally, however, a valve plug is found so firmly seated in the cylinder that the wrench just described cannot be used. In that case the several pieces *D, E, F* and *G* are used. If the valve plug is tapped for a petcock, the bolt *D*, which is ⅜ in. in diameter and about 4 in. long, is put through the hole with the head end of the bolt downward. If the plug is tapped for a spark plug, the piece *E*, which is threaded outside



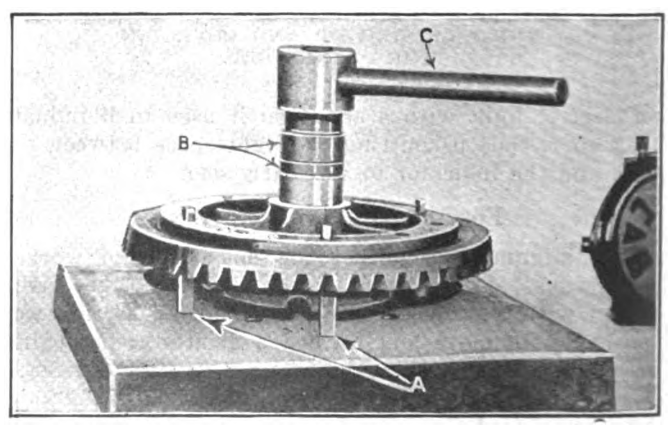


FIG. 3. FRONT AXLE BEARING CUP ASSEMBLING. FIG. 4. RIVETING FIXTURE FOR DRIVE GEAR

and has a $\frac{7}{16}$-in. hole through it, is screwed into the plug and the bolt is inserted through this piece. Then part *F*, which also has a hole drilled through it, is placed in the plug with the lugs fitting into the four slots and with the bolt protruding from the upper end. Then the nut *G* is screwed down on the bolt so as to hold the piece *F* firmly in place. Part *F* is milled to a hexagon on the upper end, and the wrench *H* is made to fit it. With this outfit any valve plug can be removed.

Each rear wheel of a Yellow taxicab fits on to a long taper bearing, being held in place by means of a key. When it becomes necessary to remove a wheel from the shaft, the puller shown in Fig. 2 is used. This puller is bored and threaded inside the same as a hub cap, so that when the hub cap is removed, the puller can be screwed on to the hub in place of the cap. This is done with the wrench shown, which fits the flat spots shown at *A*. When the puller is tightly on, it is locked in place by means of the bolt *B*. Then the tapered end of the wrench handle is inserted in the hole in the stud *C* and the stud is screwed against the end of the axle shaft. The operation is slow, but sure.

While it is a comparatively simple manner to knock a bearing cup out of an axle, it is not always so easy to put one in again. In Fig. 3 is shown what is called a front axle bearing-cup puller, but in this case the puller is

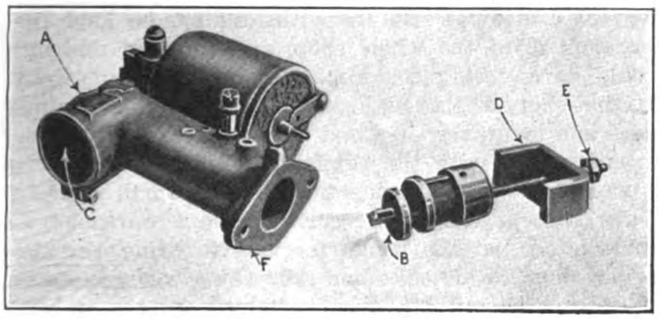


FIG. 5. TOOL FOR REMOVING VENTURI TUBE FROM CARBURETOR

used for assembling instead of disassembling. The cup *A* is held in place and the piece *B*, which resembles a stud with a large disk-shaped head is inserted from the bottom as shown. Then the part *C* to which is attached the handle, is screwed on to the stud. The stud can be seen sticking up past the handle.

Part *C* is a flat piece in which a hole is drilled for the stud, and which acts as a thrust bearing for the handle. The hole in the center is just large enough for the stud to pass through, and the piece holds three capscrews which serve to hold this piece and the handle together, without interfering with the operation of the handle. This is accomplished by having the studs set so close to the handle that the inner side of each capscrew head fits into the groove in the hub of the handle, as shown. The stud is $\frac{3}{4}$ in.–10 thd., and the capscrews are $\frac{1}{4}$ in.

The fixture shown in Fig. 4 is for the purpose of holding a differential flange and a drive gear together while they are being riveted. The studs *A*, of which there are five, are spaced so that every other rivet hole comes over a stud. Five rivets are put in place, and the assembly is set on the fixture with the head of each rivet resting on the stud as shown. An air hammer is used to head the rivets over and then the other five rivets are placed in and the operation is repeated. The two parts indicated at *B* are washers, the thickness

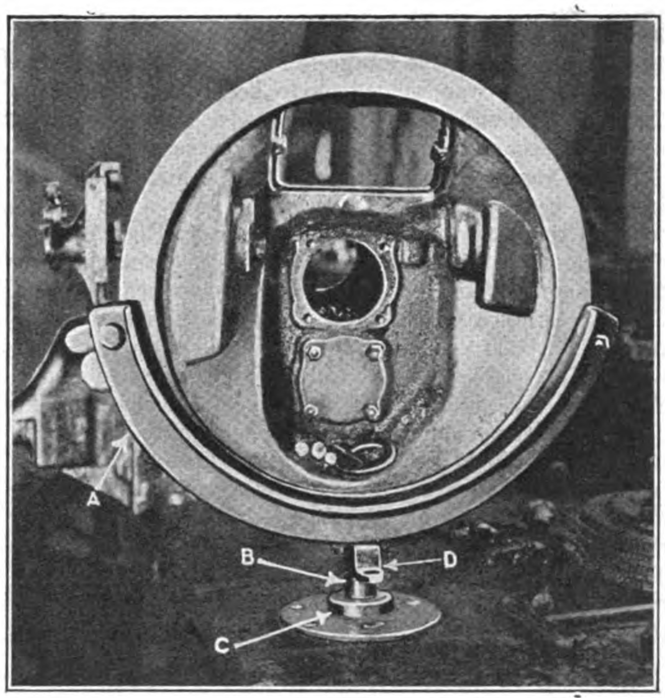


FIG. 6. TRANSMISSION CASE STAND

of which varies with the difference in the design of the flanges. The assembly is clamped and held in place by the handle *C*.

It is claimed that one of the most difficult of service operations is that of removing the Venturi tube from a carburetor. The device used for this operation in this plant is shown in Fig. 5. The stud, which is $\frac{1}{4}$ in., 20 thd. by 6 in. long, is inserted in the carburetor through a hole at the back end which cannot be seen in the picture but is indicated at *A*. The washer *B* is put into the carburetor through the hole *C* and placed on the stud, then the brace *D* and the nut *E* are put on to the stud, the brace resting on the face of the carburetor flange at *F*. Drawing down the nut *E* will then pull the tube from the carburetor.

A device for holding transmission cases while they are being worked on is shown in Fig. 6. The frame *A* was forged to shape in the blacksmith shop and

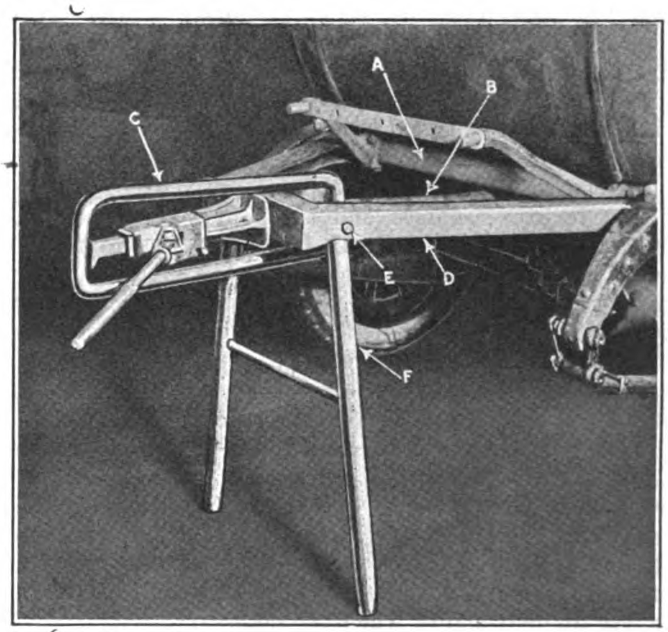


FIG. 7. DEVICE FOR STRAIGHTENING FRAME REAR CROSS MEMBER

welded to the stud *B*. This stud is 1¼ in. in diameter, and the collar *C* of the flange is 2½ in. in diameter. The small brace *D* was welded on to keep the frame from tipping, although if the collar were high enough it does not seem that this should be necessary.

It has happened several times that vehicles have run into the back end of the taxicabs in such a manner as to bend the rear frame cross member *A*, Fig. 7. Considerable difficulty was experienced in straightening these members until the apparatus shown was devised. The piece indicated at *B* is a 1½-in. shaft hinged to the large link, *C*, at one end, and with a hook on the other end which hooks around the frame cross member. When the jack is operated in the position shown, sufficient pull is exerted on the cross member to straighten it without preheating. The framework of the device *D* is of heavy angle steel hinged by the rod *E* to the legs *F*. These legs are of 1½-in. pipe. The rod goes clear through the frame, acting as a hinge for both legs. The link *C* is made of 1⅛-in. round stock. The ends of the frame *D* are cut so that so that they will fit into the angle formed by the rear cross member and the spring hangers.

The Machine Shop Superintendent

By F. P. Terry
Belfast, Ireland

Much has been written about new tools, jigs and fixtures, high-speed steels and many other things which enter into the running of a modern machine shop, but very little about the most important item of all—the machine shop superintendent, and I am quite sure the lucky or unlucky individual who is in this position often wonders why he is left alone.

The machine shop superintendent is very much in the same position as the regimental sergeant-major, except that the latter is all right so long as he obeys orders while the superintendent very often has to make his own orders and then be brought up against a court-martial if they don't come out as expected, while every foreman under his control considers what a soft job he has and would give anything to get it. There are also directors and general managers who occasionally wonder if the superintendent is filling any useful purpose, seeing that every department is well looked after by capable foremen, forgetting, of course, that most of them have been put there by the superintendent, often after opposition by those above him.

Of course, many superintendents are a great deal to blame for the troubles and trials of their positions, one of the greatest faults being the desire to retain every item of authority in their own hands, making the foremen mere puppets, consequently adding to their own difficulties a hundredfold as no one takes any responsibility but themselves.

What are the qualifications necessary to become a successful machine shop superintendent is a question that can be answered in many ways according to the circumstances of the case. The class of shop and the work to be done must be considered, but whatever the conditions it is absolutely necessary for the superintendent to have a thorough knowledge of his work, an excellent memory, a temper under control and the means to lose his personality whenever necessary.

Two of the most successful superintendents known to me possessed the above qualifications, but in many ways were as wide apart as the poles. One was the dryest old Scotsman I ever met, but as far as the machine shop was concerned he was the youngest machinist in enthusiasm. Every new type of machine tool or jig must be tried out as quickly as possible. Turret lathes were as much to him as a toy motor car to a youngster. If any foreman or workman could suggest anything to save time he was delighted, but I don't think I ever saw him smile. He was a very strict disciplinarian without being offensive, as everyone knew an order was an order and there was the end of it. I remember being in his office one morning. We were both busy over some new jigs, when an office boy came in to tell him that there was a lady in the waiting room who wanted to see him. "Tell her I dinna see ladies in the morning," he blurted out, and the boy left. I afterwards found out that the caller was his wife and had brought an important letter for him, but she had to take it back again. When the boy returned with his message the lady explained that she was the superintendent's wife. "I cannot help it, ma'am. I am not going back as I want to keep my job," he said.

Another Type of Superintendent

The other superintendent, a Yorkshireman, was a born humorist, and I often thought it a great pity he was so successful at his work because the stage lost a great comedian. But notwithstanding, he kept perfect control of the whole shop, and foremen and men would do anything for him. During the time I was in the shop a thorough re-organization was taking place and many new jigs and fixtures were being made. In connection with the suggestion scheme, the superintendent adopted an idea that is well worth copying. When a suggestion was received from a workman, he immediately got the man's foreman to bring the suggester along to his office and everything was gone over. If considered suitable, the draftsman started in with instructions to consult the workman as much as necessary. Many times only the bare idea was forthcoming from the workman who often had only a vague idea of drawing, and the complete article frequently had the suggestions of the superintendent, foreman, toolroom foreman and draftsman, but when the drawing was finished and the name given to the jig, there always appeared the words "Suggested by John Blank" with the date. This, of course, appeared on all blueprints that came into the shop, and when the device was made and tested the whole business came before the suggestion committee and whatever the award the name on the blueprint was the more highly valued. It was my pleasure when quite a young man to see my name put forward in this manner, although the actual idea was advanced beyond any dream of mine by the superintendent, who never claimed anything.

Both the superintendents referred to have passed away, but their methods can be copied today. They feared no man, but never forgot that the man who pays the piper has some choice in selecting the tune. Both read the American Machinist from cover to cover and anything new or interesting in advertising or news was put before foremen and men. They were accessible to the floor sweeper, but never interfered with the foremen's authority. They made mistakes and were not afraid to admit it. They required responsible foremen, storekeepers, etc., believing in everyone carrying their own share.

Methods of Machine Tool Design

Continuing the Fourth Article—Analysis of Belt Drive for Planer—Reasons for Stalling, Slipping and Squealing Belts—Energy and Acceleration Diagrams

By A. L. DeLEEUW

A BELTED planer drive presents certain problems which merit careful analysis. The main features of a planer drive are that it must run the planer alternately in opposite directions, it must run at frequent intervals, and it must do this act of reversing quickly. The problem is made more complicated by the fact that the planer must run faster one way than the other.

The general construction is too well known to be described here, and we will mention at once certain facts which must be kept in mind when designing a planer.

(1) Belts must not run slower than 1,000 ft. per minute in order that they may be shifted.

(2) Belts must not run faster than 4,500 ft. Higher speeds are apt to diminish the arc of contact, due to centrifugal force, which may also cause an air cushion to be formed between belt and pulley.

(3) Supposing the pulleys to be of cast iron, their circumferential speed should not be more than 5,200 feet.

(4) The pulleys should run as fast as possible in order to use belts of a minimum width.

Drive for an Imaginary Planer

Keeping these requirements before us, we can now analyze the drive for some imaginary planer. Suppose the planer is to transmit 12 hp. on the cutting stroke, then the question is: What shall be the belt width and what the belt speed? We will use a double belt, which in an ordinary drive can transmit a pull of 60 lb. per inch width, but which we will load with 45 lb. because a planer belt should shift freely and should be, therefore, under light tension only—

12 hp. $= 12 \times 33{,}000$ lb.-ft. per minute. This amount divided by 45 will give us the product of belt speed and width. The product is $\frac{12 \times 33{,}000}{45} =$ 8,800. We might use a 2-in. belt running at 4,400 ft. per minute or a 3-in. belt at 2,933 ft., or a 4-in. belt at 2,200 ft., etc. At first glance it would seem that a 2-in. belt is the proper size to use. It shifts easily, requires light bearings, does not pull hard on the shaft, and the belt speed, though high, is still within the limits.

We will further suppose that the return speed of the planer must be 2½ times the cutting speed and we will see to what this requirement leads us. We can obtain this increased return speed by making the counter pulleys of even size and making the driving pulley on the machine in ratio of 2½ to 1, but we see immediately that this would not do. If we did, the return belt working on a small pulley would have to start up the big driving pulley, and this would mean a great deal of slippage. We will be compelled to keep the machine pulleys of nearly even size. A ratio of 4 to 3 is about the limit. We might make the machine pulleys of even size, but then one counter pulley would be 2½ times as large in diameter as the other and that would mean that the cutting belt would have a low speed even when we use the highest permissible speed for the return belt. We see then, that we must compromise and that, in order not to have too much difference in belt speeds, we must make the difference between the machine pulleys as great as possible. We will try pulleys of 40 in. and 30 in. in diameter. If the corresponding counter pulleys are y and x, then $\frac{x}{30} = 2\frac{1}{2} \times \frac{y}{40}$, so that $\frac{x}{y} = \frac{75}{40} = \frac{15}{8}$

If the return belt speed is V, then the rim of the cutting pulley will have a speed of $\frac{40}{30} \times V$. If we further suppose that the pulleys will be cast iron, then we must take care that at no time shall the circumferential speed of any pulley exceed 5,200 ft. per minute, so that $\frac{40}{30}V = 5{,}200$ ft. or less, and therefore $V = 3{,}900$ ft. or less. Accepting for the present $V = 3{,}900$ ft., we find that the large counter pulley has that speed and therefore the small pulley has a speed of $\frac{8}{15} \times 3{,}900$ ft. $= 2{,}080$ ft., which is the speed of the cutting belt.

We found the product of belt width and speed to be 8,800. The belt width is therefore $\frac{8{,}800}{2{,}080} = 4.23$ in. As this is not a commercial size we will select 4 in. for the width. This being less than the theoretical amount, we will check up, and see if the pull per inch width has become too much. The pull is $\frac{4.23}{4} \times 45 = 47.5$ lb. This is close enough to the desired amount to be acceptable.

Selecting the Countershaft Speed

Next we select a countershaft speed which will give us the desired belt speed. Of course, any speed would do, provided we selected the proper sizes of pulleys. The large pulley must have a speed of 3,900 ft. This pulley would have to be 149 in. in diameter if the countershaft speed were 100 r.p.m. and proportionally less for higher speeds. The diameter of the small pulley would be $\frac{8}{15} \times 149$ in. $= 80$ in. We do not need to hesitate to go up with the countershaft speed to 400 r.p.m., we should merely see to it that the large pulley does not become too large nor the small pulley too small. At 400 r.p.m. the diameters would be 37¼ in. and 20 in. As 37¼ in. is not a commercial size we must take either 36 in. or 38 in. We will select 38 in. and that for two reasons: In the first place, we have paid no attention to the fact that there is necessarily some slip of the belt, so that if we have a pulley of 37¼ in. diameter we would have *less* than 3,900 ft. belt

speed. In the second place, we have neglected to take the thickness of the belt into consideration. This is a quite common error. We will find that it amounts to very little *in this particular case*. However, it may amount to more when small pulleys are used and, in any case, though small variations from the theoretical values may be tolerated in machine design, they should be noted so as to avoid *piling error upon error*.

What we have to consider now is this: We will get the proper return speed when the lower pulley, which is 30 in. in diameter, is driven by an upper pulley of $37\frac{1}{4}$ in., which is a ratio of $\frac{37\frac{1}{4}}{30} = 1.241$. As a matter of fact, however, we should have figured the diameter of the pulleys at the neutral axis of the belt. The thickness of belt used for our drive may be estimated to be $\frac{5}{16}$ in. so that we should take $30 + \frac{5}{16}$ in. and $37\frac{1}{4} + \frac{5}{16}$ in. for the diameters of the lower and upper pulleys respectively. The ratio between such pulleys would be $\frac{37\frac{9}{16}}{30\frac{5}{16}} = 1.238$. We see then, that the lower pulley runs a little too slow; very little, it is true, but this little and the belt slip justify us in selecting the next higher rather than the next lower size. And so we will make the upper pulley 38 in. This makes the small countershaft pulley $\frac{8}{15} \times 37\frac{1}{4}$ in. $= 20$ in. Here again we find that the diameter should be somewhat less than 20 in., but we make it 20 inches.

We now have a set of conditions as shown in Fig. 53. We know that one of the belts must be open and the other crossed, and the question is: Which belt should be crossed? As a rule the crossed belt is put on the cutting pulley and this is sometimes correct, but not always. If the planer is designed to take very heavy cuts and to have a moderate or low return speed, the crossed belt should be on the cutting pulley; but if the cuts to be taken are rather light and the return speed is high, the crossed belt should be on the return pulley. Quite often the conditions we have to deal with are not so clean-cut and the conclusion not so obvious. We should analyze the problem more fully.

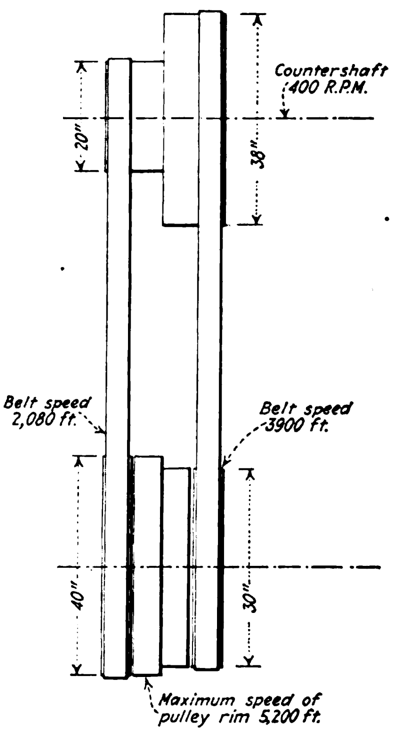


FIG. 53. PLANER PULLEYS AND BELTS

It is often believed that we cannot give the planer as high a return speed as we might wish because it takes too much power to give the heavy table and its load the momentum or rather *energy* which it possesses when running at high speed. The following analysis will show what is fairly well known nowadays—that it is not the momentum of the table but that of the pulleys, which sets the limit on the return speed. The pulleys are supposed to be of the sizes as shown in Fig. 53, the table is supposed to weigh 25,000 lb., and a load of another 25,000 lb. is supposed to rest on the table. The belt is supposed to go on the return driving pulley. In so doing it must give the table and its load the energy due to a speed of 100 ft. per minute and to the pulleys an amount of energy depending on their weight and velocity. In the accompanying calculation no rotating parts are considered except the rims of the pulleys—no arms, hubs nor beads, and no gears. Neither is friction considered though it is plain that

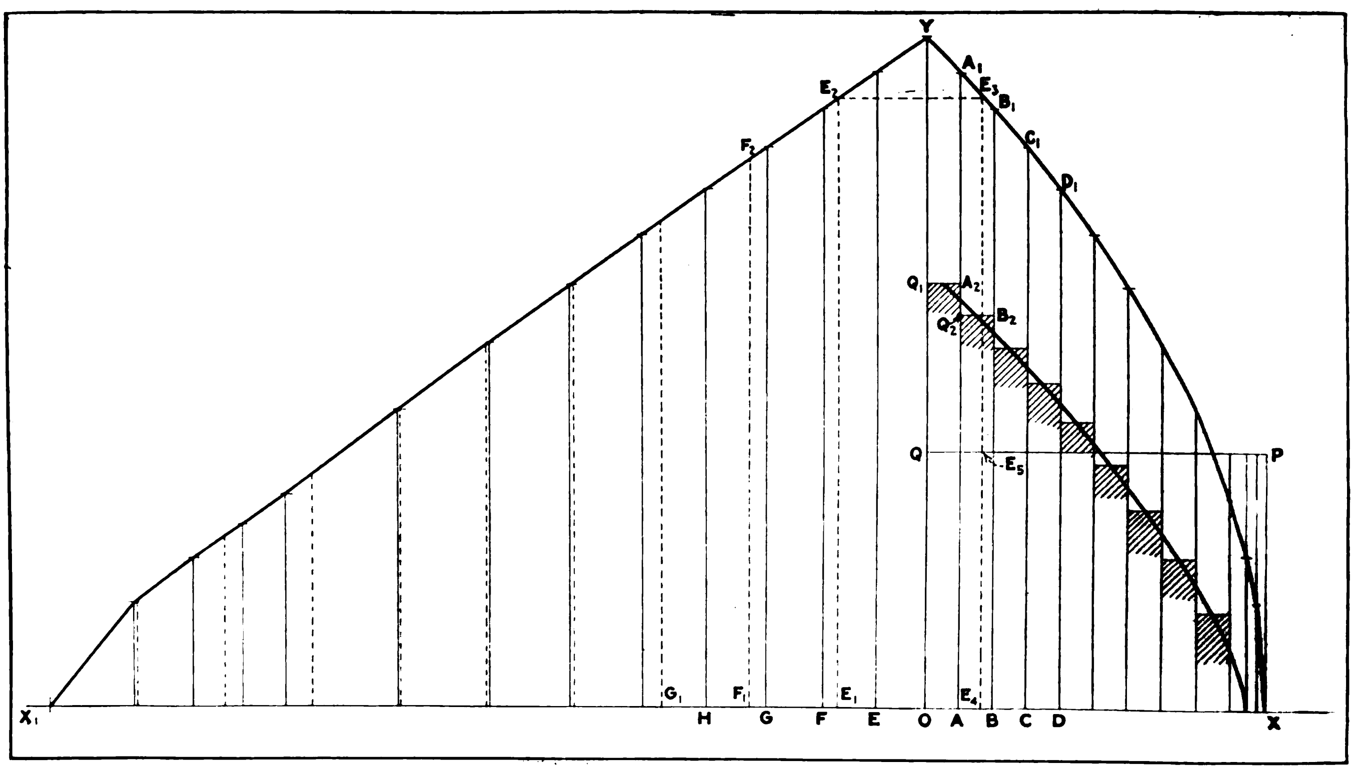


FIG. 54. DIAGRAM OF FRICTION FORCES IN A PLANER

the friction will add considerably to the work the return belt must perform.

Width of pulley = $4\frac{1}{2}$ in.
Diameter small pulley = 30 in.
Diameter large pulley = 40 in.
Surface speed small pulley = 3,900 ft. per minute.
Surface speed large pulley = 5,200 ft. per minute.
Thickness of pulley rim $\frac{3}{8}$ in.
Energy of double pulley $E = \frac{1}{2} MV^2$.

$$E = \frac{1}{2} \times \frac{30}{1} \times \frac{22}{7} \times \frac{9}{2} \times \frac{3}{8} \times \frac{26}{100} \times \frac{1}{32} \times \frac{3{,}900}{60} \times \frac{3{,}900}{60} + \frac{1}{2} \times \frac{40}{1} \times \frac{22}{7} \times \frac{9}{2} \times \frac{3}{8} \times \frac{26}{100} \times \frac{1}{32} \times \frac{5{,}200}{60} \times \frac{5{,}200}{60} = 9{,}204 \text{ lb.-ft.}$$

Weight of table 25,000 lb.
Weight of work 25,000 lb.
Speed of table 100 ft. per minute.
Energy of table

$$E = \frac{1}{2} \times \frac{50{,}000}{1} \times \frac{1}{32} \times \frac{100}{60} \times \frac{100}{60} = 2170 \text{ lb.-ft.}$$

Energy of pulley and table = 11,374 lb.-ft.

This shows that less than one-fifth of the work done is spent on the table and its load, and more than four-fifths on the rims of the pulleys.

When the belt has been shifted onto the return pulley it will ultimately give the table its full speed of 100 ft. per minute, provided that it is capable of doing somewhat more than overcoming the friction of the various parts. However, we would not be satisfied if the table did not attain this speed in a very short time, that is, before it has traveled many inches. If we assume that the table will have reached its full speed at the end of 12 in. travel, then we know that the belt must have delivered 11,374 lb.-ft. of energy in $\frac{1}{100}$ minute (this being the time in which the table travels 12 in). However, when we consider that the table was not always traveling at a speed of 100 ft. per minute, but started with a speed zero, we see that it took the table $2 \times \frac{1}{100} = \frac{1}{50}$ minute to travel the 12 in. between no speed and full speed. In $\frac{1}{50}$ minute then, the belt delivered 11,374 lb.-ft. or at the rate of $50 \times 11{,}374$ lb.-ft. = 56,870 lb.-ft. per minute. This is about 18 horsepower.

This belt runs 3,900 ft. per minute, so that the belt pull is $\frac{18 \times 33{,}000}{3{,}900} = 152$ lb. Using a 4-in. belt, the pull per inch of width will be 38 lb., which is less than the pull on the cutting belt. For that reason we put the cross belt on the cutting pulley and the open belt on the return pulley.

The belt shifter for a planer is generally a cast-iron eye attached to a pivoted arm. There are two such arms, one for each belt. Like other shifters, they act on the slack side of the belt. As a rule they are operated by a cam which first removes the belt from one pulley and then leads the other belt onto the other pulley. Let us suppose that the cutting belt has been moved from its tight pulley and that the return belt is being led onto its pulley. This operation is accomplished by a dog on the table striking the tappet which, in its turn, moves the shifter levers through certain connections and a cam. When the dog first touches the tappet the planer table is still going at the full cutting speed. Shortly after, the tappet has moved far enough to take the cutting belt off its pulley. For a very short period of time the planer must run by the momentum of its parts. However, almost immediately after the cutting belt has left its pulley, the return belt moves onto its tight pulley. This latter pulley is running in the direction opposite to that of the entering belt, so that this belt will have a braking effect as soon as it gets into contact with its pulley. As a consequence the planer slows down and, as a further consequence, the tappet moves at a slower rate and so does the entering belt. Gradually the planer table comes to a standstill which means that the tappet and therefore the entering belt ceases to move. The entering belt is only partly on its pulley. As the pulley has come to a standstill, but the entering belt is, of course, still moving, this belt will now begin to give the pulley a movement in the opposite direction.

At this point various things may happen. It may be that a sufficient width of the return belt has come on the return pulley to enable it to start the planer in the return direction. Or it may be that the proportions of tappets, connections and cams were such that the belt had moved very swiftly onto the pulley, so that a much greater part of the width of the belt is on the pulley than what is necessary for the mere stopping of the planer. In that case there will be a very quick stop and a very quick picking up of the return speed. A third possibility is that the belt has moved onto its pulley at a very slow rate, that there is but a very small portion of the width of the belt on the pulley, but that it has taken such a long time that the loss of momentum by friction combined with the braking effect of this small portion of the belt has brought the planer to a standstill, and yet that there is so little of the belt on the return pulley that it does not have the necessary power to overcome the friction and give the planer the necessary acceleration in the opposite direction. A great many troubles which one may experience with belt-driven planers are due to the lack of consideration given to this process of shifting.

The first action of the belt when it enters the driving pulley is to stop the planer, in which action it is assisted by friction. After the planer has come to a standstill the same belt proceeds to give the planer a movement in the opposite direction, which action is opposed by friction. In either case the end to be accomplished is to give the moving parts of the planer a certain amount of energy. In order to see how the action of the belt and the friction of the parts affect the operation of the planer we will consider these two items separately.

In Fig. 54 is shown a diagram indicating the manner in which a planer would be brought to a standstill by friction only. *OA*, *AB*, *BC*, *CD*, etc., are equal distances representing the distances traveled by the planer table, beginning at full speed and ending with the planer table brought to rest. There are a great number of parts in the planer which moves as long as the table moves. The weights of all these parts are fixed, and their speeds are all in a certain fixed relation to one another so that, instead of considering all these items separately, we may imagine that there is a single part of a certain weight moving at a certain speed and that this single part possesses as much energy as all the various moving parts of the planer possess. This part will give up its energy by friction, and as the amount of work done against friction is the

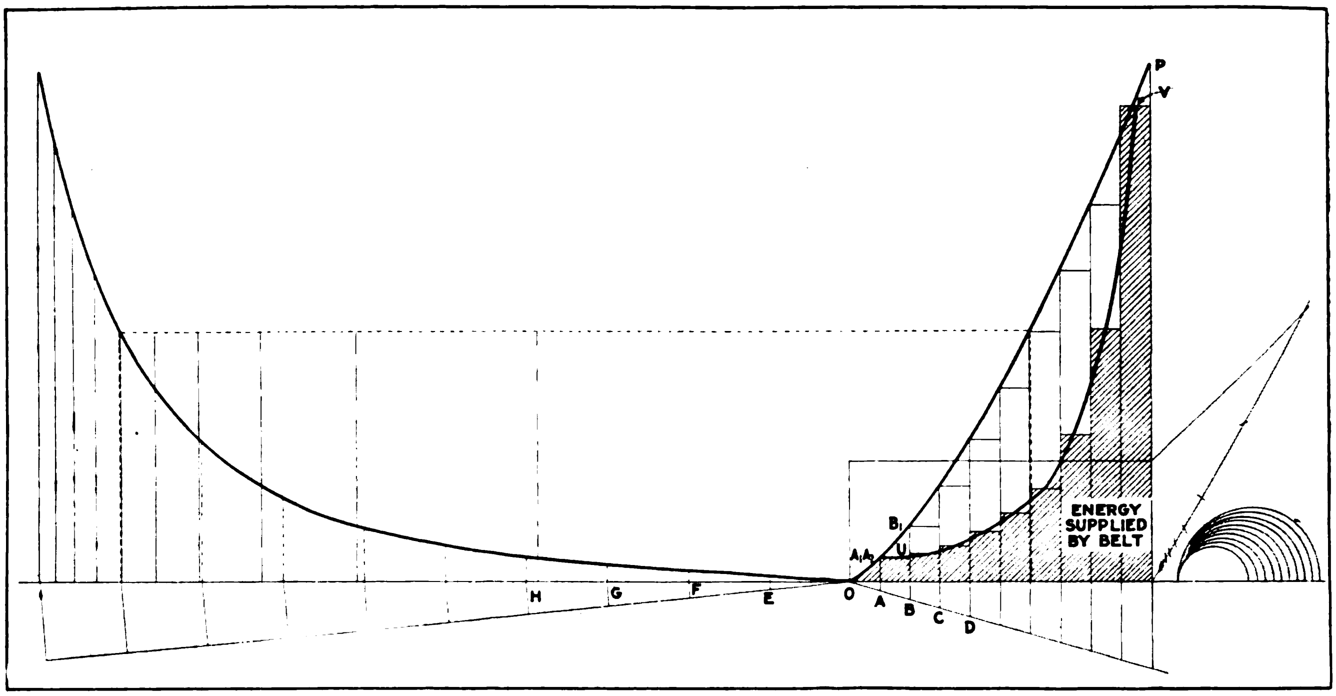


FIG. 55. DIAGRAM OF ACTION OF DRIVING PULLEY

product of the weight, the coefficient of friction and the distance traveled, equal amounts of energy are given up when equal amounts of distance are traversed.

When the planer has traversed a distance OA, it has lost a certain amount of energy as a result of which the speed has been reduced from OY to AA_1. This length AA_1 can be found by considering that the amount of remaining energy has been reduced in proportion of OX to AA_1 and that the speed therefore must have been reduced in the proportion of $\sqrt{OX}:\sqrt{AA_1}$. Similarly we can find the length of the lines BB_1, CC, and DD_1, and the curved line XY will show how the speed of the planer varies between full speed and a complete standstill if the parts are affected by friction only. Of course, it will be recognized that, in order to get the correct diagram, a larger number of points should be laid out than shown here.

It would also be interesting to know how the speeds vary when we consider equal time elements, and it would further be interesting to see how the energy of the planer is absorbed by friction.

In order to find the relation between time and speed we lay out on OX_1 the times required to traverse the distances OA, AB, BC, CD, etc. We find the distance OE as follows: We imagine that the speed has not changed while the planer has traveled from O to A, and we make the time required for that amount of movement our unit and lay it out as the line OE. We further imagine that the speed does not change between A and B and that this speed is AA_1. The question then is to find the line EF. As the times required for equal stretches are in inverse ratio as the speeds we find that: $OE:EF = AA_1:OY$. Similarly we find that $FG:EF = AA_1:BB_1$, etc. In this manner we find the times OE, EF, FG, GH, required to travel equal distances, and we obtain the diagram X_1Y as the curve for speed in relation to time.

In order to find the manner in which the energy of the planer is absorbed by friction we will use the same diagram in which we consider the area $OXPQ$ to represent the total amount of energy to be absorbed. We divide the line OX_1, which represents the total time required to bring the planer to a standstill, in as many parts as we had laid off on the line OX. These parts, then, represent equal times and are indicated by the lines OE_1, E_1F_1, F_1G_1, etc. The perpendicular E_1E_2 indicates the speed at that moment. We draw E_1E_3 and the perpendicular E_3E_4. This line E_3E_4 also indicates the speed of the planer at the moment indicated by the point E_1. During this period of time the speed of the planer has been reduced from OY to E_3E_4, so that the amount of energy absorbed during that time is OE_4E_3Q. In a similar way we can find the amounts of energy absorbed during the time E_1F_1, F_1G_1, etc. And as these times are all alike we will plot the result on the right side of the diagram by placing on the base line equal distances. We already have such equal distances, namely OA, AB, BC, etc., and we will therefore use them as the measures for equal times. We should remember that heretofore we have been using these distances as a measure for equal distances traveled by the planer and we obtained in that manner the curve XY; now we will use these same distances as measured for equal times and try to obtain the curve indicating the absorption of energy.

The energy absorbed during the first element of time was OE_4E_3Q. The area of this rectangle must be represented on the base OA. The new rectangle will be OAA_2Q_1. In similar manner we find points F_1, F_2, F_3, F_4, F_5 and the rectangle ABB_2Q_2. The curve thus obtained shows the manner in which the energy is absorbed by friction only.

The diagram of Fig. 55 shows how the belt shifting onto the driving pulley gradually gives the planer energy in the direction opposite to the one in which it is running. As the belt moves onto the pulley the force with which it grips the pulley gradually becomes greater and the negative acceleration it gives to the pulley becomes greater in proportion to the width of belt. We must further remember that the width of belt on the pulley is proportional to the distance traveled by the planer after the belt has entered the pulley. These distances traveled by the planer are in-

dicated by OA, AB, BC, CD, etc. The acceleration (negative) given to the planer parts is indicated by AA_1, BB_1, CC_1, etc. If we consider the acceleration constant during the very short time the planer moves from O to A, or from A to B, or from B to C, we will be able to construct our diagram for speeds. The speed AA_2 equals $\sqrt{2aD}$, in which D is the distance traveled and a is the acceleration. The speed BB_2 is found in the following manner: This speed consists of the initial speed AA_2 plus an increment due to the acceleration. This acceleration is not a but $2a$, so that B_1B_2 equals $\sqrt{4aD}$. Similarly we would find that the distance C_1C_2 would equal $\sqrt{6aD}$. In this manner we find the curve OP for the speeds when equal distances are traversed, and we must remember that these speeds are negative speeds.

To construct the diagram for speeds in relation to time, we lay out the distances OE, EF, FG, etc., each one of these distances representing the time in which the unit of distance OA is traversed by the planer. Again we treat this diagram as we treated the diagram of Fig. 54 in order to find how the energy is absorbed by the entering belt, and we find curve UV.

In the diagram of Fig. 56 the two energy absorption curves of Figs. 54 and 55 are laid together. The lower part shows how the energy is absorbed by the belt. The energy diagrams of Figs. 54 and 55 are shown here on the same scale. This energy is represented by rectangle $ABCD$. The planer will be brought to a complete standstill when the sum of the areas covered by the two diagrams is equal to the area $ABCD$. This happens at the line PQ. As it happens in the illustration the two diagrams are almost each other's complement. This is the ideal condition. If there should be a large opening between the two diagrams it would indicate that there is less energy absorbed during part of the time than what might have been, *i.e.*, that it will take an unnecessarily long time to stop the planer. In other words, there is too much overrun. If, on the other hand, the diagrams overlap each other we have the condition that the belt is brought on the driving pulley at too fast a rate. The belt is called upon to do too much work because no advantage was taken of the friction. In that case we will have too much slip with resultant squealing of the belt.

The dog on the table ceases to act on the tappet as soon as the planer has come to a stop. From that moment on, the table moves in the opposite direction and there is, therefore, no way of shifting the belt further. The shifting mechanism should be so proportioned that the full belt width is on the pulley when the table has traversed the distance AP. If the action of the shifting mechanism is too slow, the planer will stop before the full width of the belt is on the pulley. The result may be that there is not enough power for the cut or reverse (stalling) or there may be a general slowing down of the machine (continued slippage and squealing). If the action is too fast there will be excessive slippage for a short period of time with a possible burning of the surface of the belt and uncertainty as to the point of reversal.

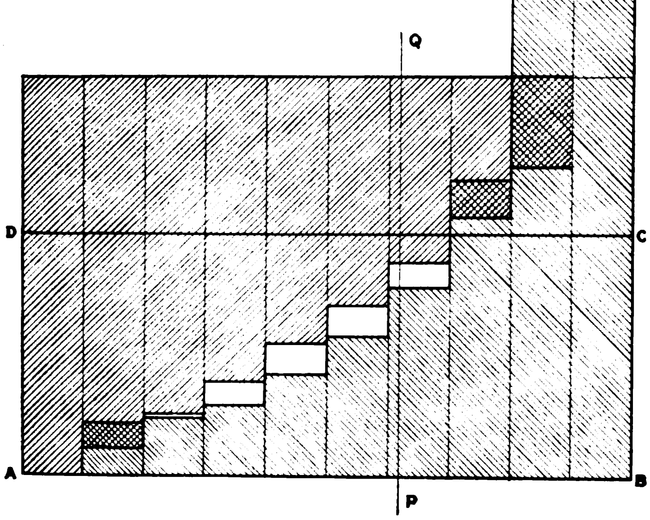


FIG. 56. COMBINATION OF ENERGY ABSORPTION CURVES OF FIGS. 54 AND 55

Why Some Tools Are High in Price

By John R. Godfrey

"A hundred and fifty dollars for that tool? Why I could make one for less than fifty if it wasn't patented. You fellows want to make too much money all at once. Come in next time you're around this way." This was the remark which greeted a friend of mine who tried to sell a new tool for use in repairing motors to a garage man. So he had to tell him a few wholesome truths.

"You're right about the cost," he said, "only you've got it too high." But that's only the beginning. Next we have to spend good money for space in the *American Machinist* and other papers to let you know that such a tool can be had. You look at the ad and tell Bill here that it looks pretty good, but you don't send us an order, even when we offer to send it on approval for 30 days. After a few weeks or months you get up ambition enough to write for a circular but even then you don't order. You don't even answer the letters we write you about it.

Procrastination Costs Money

"Circulars and letters cost money and unfortunately we have to eat while you're thinking it over. Now you want to put it off till next time I come around this way. You forget that it costs us real, hard dollars for carfare, food and hotel bills beside the other expenses I've mentioned.

"I know the price is high. But it's because you customers make it cost so much money to sell you. If a hundred men a month who really need this tool would send us their orders without my traveling all over the map to get 'em, we'd be glad to knock an even fifty dollars off the price you kick about. But as long as you make it hard for us to sell you this tool, we've simply got to pass the cost of this selling along to you. There's no other way. If you have to spend a day getting to a day's job, you've got to charge for two days somehow, no matter how it appears on the bill."

A Possible Remedy

These birds who boast about being hard to sell, who waste your time and hang off as long as possible before buying don't seem to realize that they are the ones who make it necessary for manufacturers to charge high prices. If we had some way of making each customer pay for the cost of selling him what he eventually buys, he'd wake up and save money as well as save us time and trouble.

Another Method of Machining Pistons

A Special Machine for Rough-Drilling Two Pistons at Once—Heat-treating to Prevent Distortion Later—The Final Reaming of the Piston-pin Hole

SPECIAL CORRESPONDENCE

THE Wills Sainte Claire motor uses cast-iron pistons of light construction and has some interesting methods of machining them. After cleaning and preliminary inspection, the open end is bored and faced, leaving $\frac{1}{32}$ in. in the bore and $\frac{1}{64}$ in. on the end for finish. The holes are then drilled in a special Reed-Prentice four-spindle drilling machine as in Fig. 1. This carries four pistons, and drills two of them at each feeding of the drills, the other pair of spindles being on the opposite side of the machine. The pistons are clamped by the bolt *A*, the two upper stations being loaded while the lower pistons are being bored.

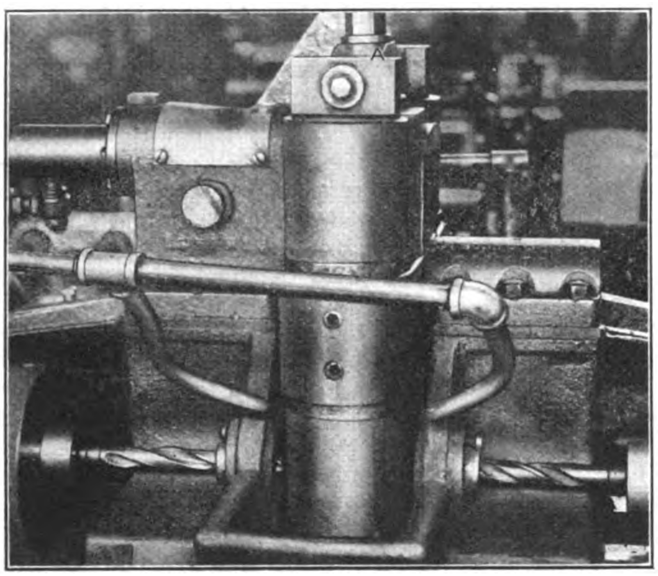


FIG. 1. ROUGH-DRILLING THE PIN HOLES

The workhead carrying the pistons is supported on trunnions which bear in the bed of the machine. This arrangement supports the work rigidly and makes accurate indexing possible. The drills are guided as close to the pistons as possible to prevent the tendency of "running" on a round surface. These precautions in the rough-drilling make it easier to secure finished pistons which are accurate, and accurate pistons are a necessity in all high-grade motors. The general solidity and stiffness of the machine are indicated by the portion shown in Fig. 1. The twin branch pipes supply flooded lubrication which flows down into the base of the machine.

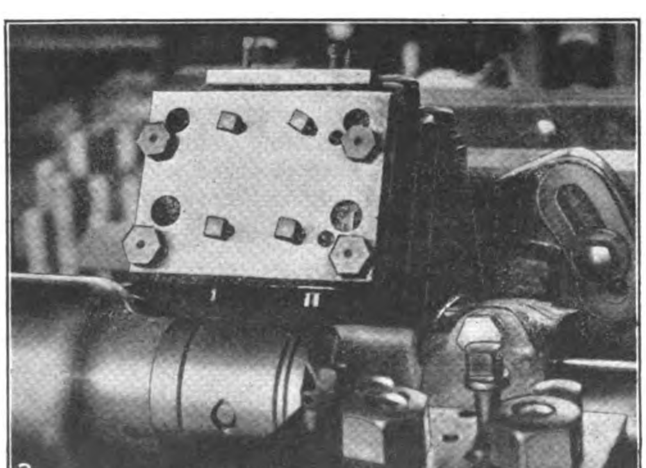
The pistons are next rough-turned on another Reed-Prentice machine as in Fig. 2. This machine also roughs the grooves with the tools in the back arm attachment, and leaves $\frac{1}{32}$ in. for finish on the outside. Heat-treating or annealing comes next, followed by another inspection. Then a slot is milled for the piston-pin cap, the end is rebored and the head is faced.

The piston-pin holes are line reamed in the fixture shown in Fig. 3. This fixture forms part of a chuck which goes on the lathe spindle and guides the reamers on both sides of the piston. A simple clamping device, not shown, makes it easy to handle the pistons in and out of the fixture.

This final reaming requires extreme care, both on the part of the workman and in the tools and fixtures used. Although the rough-drilling is from each side, it will be noted that through reaming is required for the final finish. The reamers are piloted inside the special chuck and also supported in an outer bushing to insure the desired accuracy of alignment.

The outside is next finished including the ring grooves; the relief is cut on the sides; the piston-pin hole is hand reamed; the open end is countersunk; the head is polished and the piston finally inspected before going to the assembly department.

These details of piston machining and finish give a good idea of the great care which is taken with this important part of the motor. It is in marked contrast with much of the practice of a few years ago when comparatively little attention was paid to such refinements as polishing the head and sundry other little details which make for satisfactory performance of the motor.



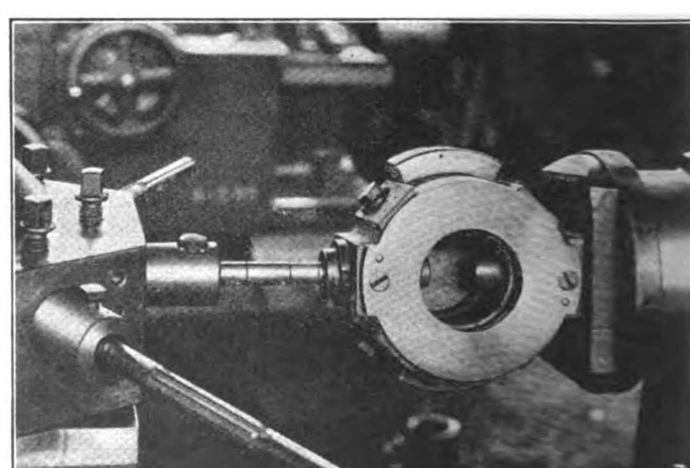


FIG. 2. ROUGH-TURNING AND GROOVING. FIG. 3. REAMING PISTON-PIN HOLES

Oxy-Acetylene Cutting Machine

Mechanically Guided Torch Cuts Intricate Shapes at Great Speed—Gas Pressure and Rate of Torch-Travel Regulated to Suit the Work

By I. WILLIAM CHUBB
Editor European Edition, *American Machinist*

While the process of metal-cutting by means of the oxy-acetylene blowpipe is by no means uncommon, the results obtained do not usually compare in any way as regards finish with ordinary machining processes. In this respect, and also as to operating cost, advantages can certainly be claimed on behalf of the Godfrey oxy-acetylene jet machine made by the Godfrey Engineering Works, Wood Green, London, N. The machine itself (see Figs. 1 to 3) is fairly simple, having a double-jointed swinging frame bearing the blowpipe, etc. Two independent screw-operated slides are carried by the machine frame, and by hand or power, will give either or both of two cross movements to the cutting-jet over the work. By means of an index head these slides can be set so that cuts can be made at any angle to the axis of the machine. A circular attachment is also provided comprising a graduated revolving arm, by means of which the jet can be caused to rotate horizontally, thereby cutting a hole of any radius up to the length of the arm itself. Trepanning operations necessary for large holes are avoided and the finish resulting is ready for the reamer. In this case the work is stationary.

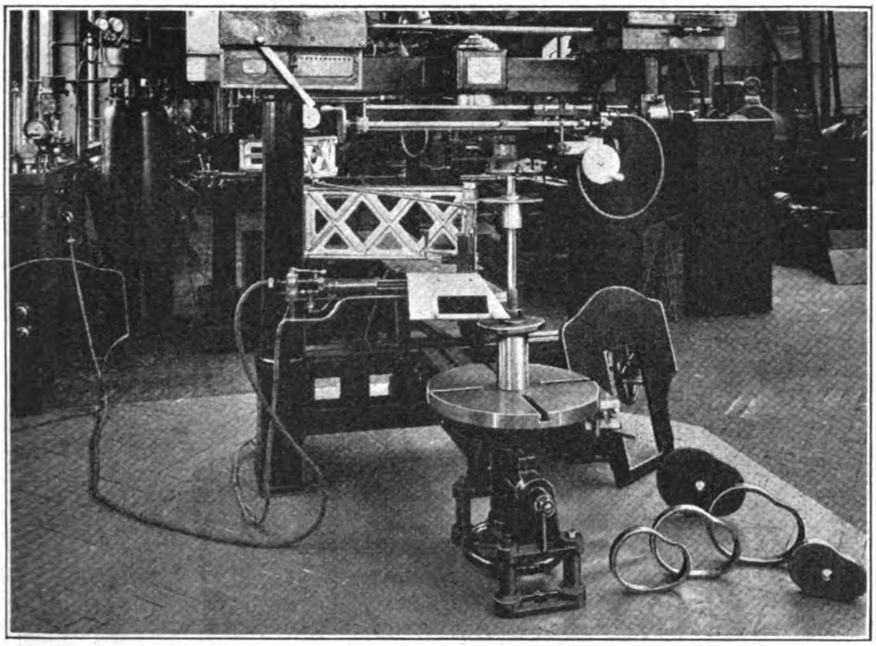


FIG. 1. THE GODFREY OXY-ACETYLENE JET MACHINE

For holes beyond the range of the arm and up to 6 ft. in diameter the work is placed on a revolving faceplate or table in front of the machine. From this table a central spindle may project upward and for shapes that are other than circular the spindle will carry at the top a templet of metal, wood or fiber, against which a pin immediately above the jet on the jointed arm is kept in contact by a spring. As the table rotates the jet itself moves and thus reproduces the shape desired, the size being that of the templet when the pin is of the same diameter as the jet. Cams and other shapes larger than the templet may be cut by using a roller in place of the pin, the maximum size of the roller depending, of course, on the radius of the smallest curve on the templet. The drive of the machine is by a ¼-hp. motor and belt, friction gearing and flexible shafting being employed for the main slides and rotary movements.

The drive is by belt to a friction disk at the top of the machine and across this disk a small drum or pulley, kept in contact by a weighted lever, can be moved radially. Two of these friction drives are employed, one on each side of the machine, and the disks are calibrated for speed, the drive being by a belt on a two-speed cone and by the flexible shafts to the revolving faceplate and the two rectangular motions. Cutting speeds ranging from ½ to 20 in. per minute are obtainable, adjustments being effected by a lever within reach of the operator's left hand. The table in front of the machine is mounted on trunnions and may be raised or lowered by a screw. For cutting bevels transversely, the roller at the back of the machine can be raised so that the work can be made to lie at any angle to the horizontal. For bevel cutting longitudinally the work is fastened to the table at the front and the table is slewed to the right or left as necessary.

Besides cutting rapidly, the machine produces a particularly good finish, and this is in a large measure due to the constant feed resulting from the mechanism employed. In addition, the flame used is of a somewhat exceptional character as the gas pressure employed is low, especially for finishing purposes. The jet is small, a whirling motion being given to the mixture by rifling and other features in the blowpipe. The length of the white cone is barely 1/16 in., and as the cone does not touch the work the edges of the material are not melted, the surface being left smooth. The heating flame, which is tubular, is but 3/16 in. in diameter and the distance of the nozzle of the blowpipe from the work is 3/16 in. The oxygen pressure employed ranges from 5 lb. per square inch upwards, mild steel plates ½ in. thick for example being best cut with a pressure of from 10 to 15 lb. The cost of oxygen per foot of a ½-in. plate, cut at 12 in. per minute is less than 1d. Finishing or washing cuts may be taken at pressures of 2½ lb. or even lower. Owing to the small area of the heating flame the acetylene consumption is less than usual.

Regulator valves are provided and a master gas tap on the blowpipe cuts off all gas without affecting these

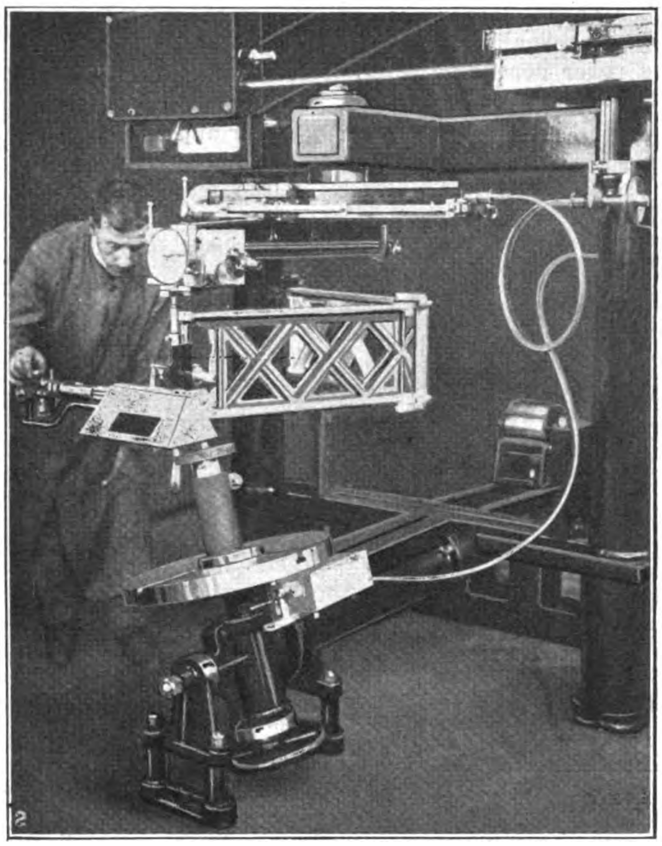
valves, so that if the correct mixture has been determined it is at once available when the appliance is next used. The valves for oxygen and acetylene have calibrated dials and pointers. The oxygen is preheated to about 60 deg. F. above the normal temperature, the exact amount depending on atmospheric conditions. An electric resistance is used for preheating the oxygen supply pipe, the pipe being formed into a coil by a couple of turns. Preheating disperses any water that may be carried by the oxygen. Pressure in the oxygen cylinders is reduced from 1,800 lb. to the required value in two stages, first down to 40 or 50 lb. by one reduction valve and the balance by another reduction valve, the purpose being to avoid pressure fluctuation. Electric ignition is employed by means of an accumulator and coil, one end of which is grounded, a lever on the blowpipe bringing the sparking point to within the required distance of the nozzle. Saving of both time and gas is claimed for this device.

Cuts $\frac{1}{16}$ and even $\frac{1}{20}$ in. wide have been made with a blowpipe orifice of 0.047 in. The smallest orifice employed is 0.035 in. in diameter. Examples of work done are shown in Fig. 4, where a cam form and three cam rings are shown as cut from a 12 in. square plate $\frac{5}{8}$ in. thick, the inner cuts being 0.06 in. wide. The hole in this example was drilled, but if it is necessary to start in the middle of a plate the hole can be blown through first, preferably by a simple hand blowpipe, to prevent plugging the nozzle of the machine blowpipes by return of the oxide.

The view at the left shows five rings and a central core cut in a $\frac{1}{2}$-in. plate, the diameters ranging from 1 to 9 in. The total time occupied for the six cuts was 9 min. 32 sec., the 9-in. ring taking 2 min. 46 sec., the 7-in. ring 2 min. 20 sec., and so on down to the 2-in. ring taking 48 sec. and 1-in. center 32 sec. This example suggests the use of the machine for the production, without waste, of printers' chases in a series of sizes from plates of suitable thickness, the chases being flat and without welds at the joints. Above the right-hand view in Fig. 4 will be seen a small piece of metal with dogtooth cuts, 0.055 in. wide. These cuts were made with a nozzle 0.047 in. in the bore.

At *A* in Fig. 5 is a reversing link for a steam engine commercially produced from metal $1\frac{1}{4}$ in. thick, the link measuring 12 in. across its longest dimension and the complete outline being produced in 6 min. The cam at *B*, measuring 11 x 9 x $1\frac{1}{4}$ in. thick, was produced by automatic operation in 6 min., and the hole in the middle piece *C* was cut for demonstration purposes in $2\frac{1}{2}$-in. metal in $6\frac{1}{2}$ min. A higher pressure is necessary for holes than for exteriors, the flame being diverted as it cuts down. For instance, a 4-in. hole in $3\frac{1}{2}$-in., 35-ton tensile steel, requires a pressure of about 35 lb., whereas a cut on the exterior will call for a pressure of about 20 lb. The pressure is increased to prevent distortion of the flame. A slower flame travel is used for holes, because in going round the flame tends to trail. The maximum thickness that can be cut is about 5 in. The thicker the material the higher the pressure needed and the larger the orifice. The flame will cut material down to $\frac{1}{4}$ in. thick, but below this is apt to produce distortion.

About the other examples shown in Fig. 5 it may perhaps be sufficient to say that the ring *D* was cut from a plate 1 in. thick. The hole is 5 in. and the outside diameter 6 in. It took 30 min. 30 sec. for both cuts, while the hexagon nut *E*, 5 in. wide across the flats and $2\frac{1}{2}$ in. thick, took 5 min. for the exterior and 4 min. 50 sec. for the $3\frac{3}{4}$-in. hole. Examples of work



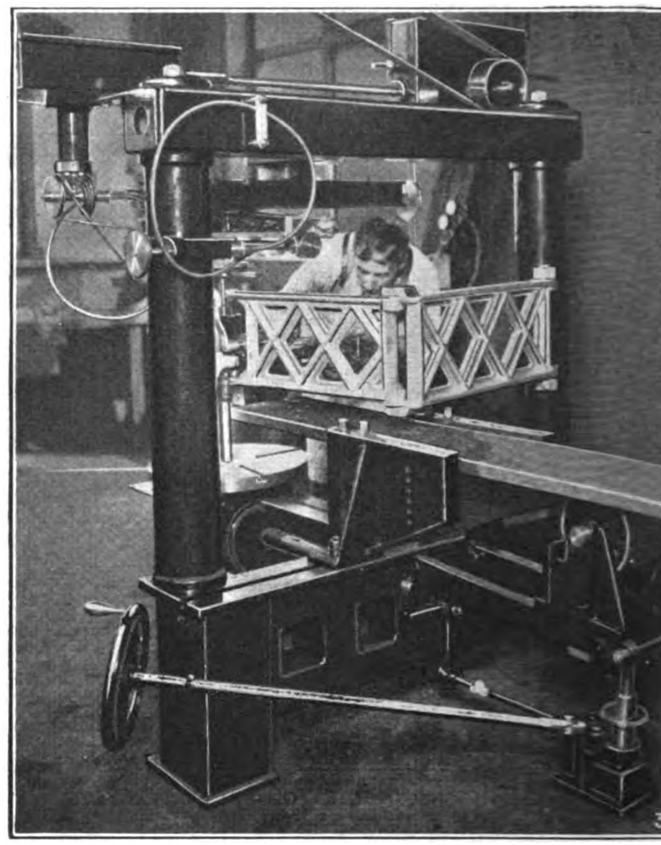


FIG. 2. GODFREY JET MACHINE CUTTING ON A PLANE. FIG. 3. GODFREY JET MACHINE CUTTING FROM A TEMPLET

seen by the writer included a 7-in. disk of ¾-in. metal mounted on a vertical spindle on the revolving face-plate. With the flame cone about 1/16 in. long, two cuts were taken, the first at 15 lb., the second, for finishing, at 10 lb. The time occupied was 2 min. 15 sec., giving a feed of about 10 in. per minute, The cut was square and the finish good.

Horn plates for railway cars have been cut complete in 17 min. in ¾-in. plate, the perimeter, including that of the hole, being about 12 ft. and the pressure employed 15 lb. A trimming made from a templet, different sized rollers being used for the outside and inside, produced the frame shown around the examples in Fig. 5. The metal is 3/16 x ¾ in. The cut is square and parallel all around, sharp corners being produced as shown, and no subsequent machining is necessary. It is usual to leave a small fin at the end of the cut to be removed by a file, otherwise a groove results owing to the absence of metal for the dissipation of heat.

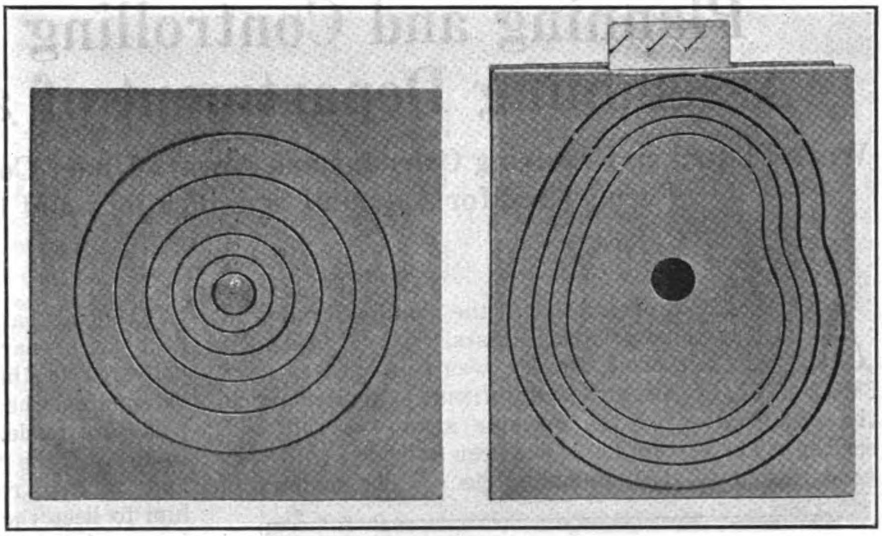


FIG. 4. CAMS AND RINGS CUT BY GODFREY MACHINE

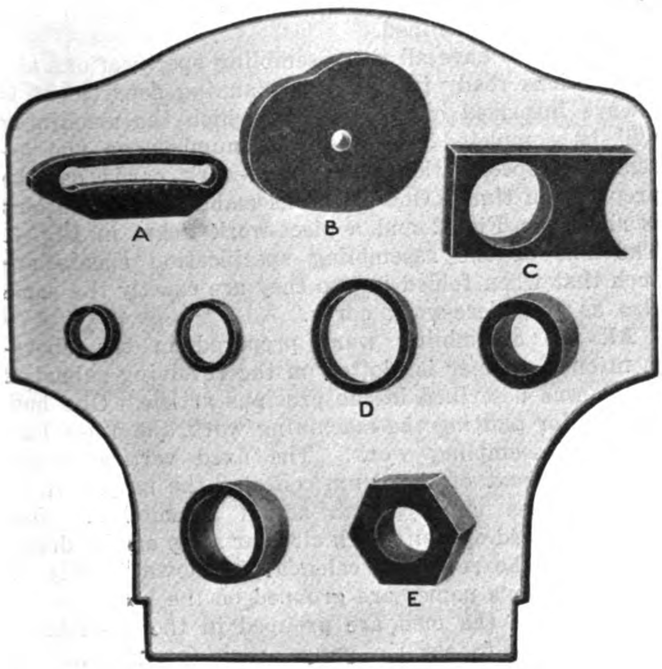


FIG. 5. EXAMPLES OF WORK CUT BY GODFREY MACHINE

By way of demonstration, gearing has been produced with from 0.002 to 0.005 in. left on the teeth for finish. Thus gears of 2-in. circular pitch mesh together and run properly, 16 teeth being cut in 16 min. in ½-in. plate. The templet used was in the form of a single tooth, the piece being indexed round. Rack teeth have been cut, and any odd shapes required may be produced either by combination of the movements of the machine or from a templet. Holes for tubes in superheater plates have been cut, the practice being to leave say ⅛ in. and then take a washing cut at a lower pressure.

The machine is adaptable to toolroom work, roughing out dies, etc., and profiling operations where the finish obtained has been found in a number of cases to eliminate further machining. It is used in the blacksmith shop, avoiding the cost of several heats on heavy masses. In shipyards heavy plates have been cut, avoiding the need for drilling and chipping and the use of power shears with their inevitable distortion of the plate and the destruction of its physical properties in the vicinity of the sheared edge. Reference has been made to the use of the machine in connection with the production of superheaters, 4-in. holes in 1⅛-in. header plates being cut in 2 min. each, the holes then being ready for reaming. Circular ends of cylindrical boilers have been cut automatically without marking out, this applying also to the welding bevel of drum tanks, produced in one cut. Where the material has been cut by the Godfrey process, the British Board of Trade investigation confirms as unnecessary the machining operations essential to remove the stressed edges as would be required in *sheared* ship and boiler plates.

For bogie frames, locomotive side frames and for similar purposes on material from ½ to 3 in. and upwards, a specially adapted form of the machine will shortly be available. The machine is of service to ship breakers for cutting old plate with a form and finish that will enhance the value of the scrap material.

The Foreman and "Labor"

By A. W. Brown

The word "labor" I put in quotation marks when I write it, because as generally used it is misapplied. It implies what is not the case, that manual workers are the only ones who labor and that no unorganized manual worker has the right to consider himself or herself in the laboring class. He or she may be in the laboring class, but is not of "labor."

The foreman occupies a peculiar position in regard to his workers. He is not of them, because he has been engaged by the management and not by them. In fact he may be more or less actively and violently opposed by some one from his shop, or from some other shop or by some one from no shop at all, who claims to represent the workers.

At the same time, he is of their stock and breeding, and can better understand them than can a member of the management. Even if the latter has been a worker of some kind, the chances are that he cannot understand the problems of any other kind; and further, probably much water has flowed under the bridges since his days as a worker and, still further, he may not be at the strategical point.

Planning and Controlling Work in the Assembling Department of a French Shop

Work Plotted on Revolving Calendar and Always Under Control of Planning Department—Forms Used for Assembly Specifications and Piece-Work Tickets

BY E. JULLIEN

A COMPLETE description of the planning system in use at the works of Messrs. Savy Jeanjean et Cie., Courbevoie, France, was published on page 889, Vol. 54, of AMERICAN MACHINIST. In that article the organization of the machine shop was fully described. The system has since been extended with very good results to the assembling floor. The manner in which the work is planned and followed out in the machine shop was fully explained in the above-mentioned article, where the use of the revolving calendar, the routing cards, the progress sheets and the calculagraph were described.

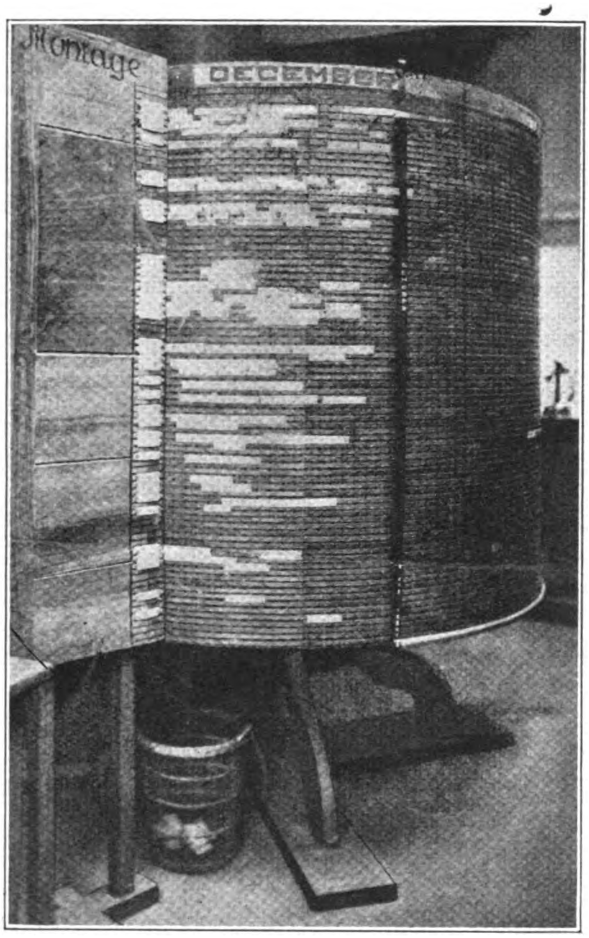


FIG. 1. THE REVOLVING CALENDAR

Near the revolving calendar, shown in Fig. 1, is a chart in which the following information is entered for each machine, or each lot of machines started: Order number, description of machines and date on which the machining is started, as well as the scheduled finishing date.

The assembling-shop planning department keeps in constant touch with the machine-shop planning department and follows the progress of the machining from the chart referred to above, the progress sheets and the routing cards. When the machining of one part, or a lot of parts is completed, the part or parts are delivered to the foreman who will be responsible for assembling the machine or machines for which the parts are made. The name of the foreman is written in one of the two blank spaces on the routing card and the card returned to the progress clerk to enable him to keep the progress sheets up to date. The routing card is then passed to the assembling-shop planning department where it is filed in a cabinet with all the other routing cards belonging to the same job. When the cards representing all the parts necessary to assemble a machine are in the file, all the parts have been delivered to the foreman whose name is written on the cards, and the machines can be assembled without having to wait for one or more parts which have not yet been machined.

In order to have all the assembling specifications and instructions ready in time, the planning department is always informed of the date at which the machining will be completed on any order number, so the assembling specifications and piece-work cards can be prepared in time. One of the assembling specifications is shown in Fig. 2 and a piece-work ticket in Fig. 3. The size of the assembling specification sheets are such that when folded in two they are exactly the same size as the piece-work cards.

All the assembling work prepared in the above-mentioned manner is plotted on the revolving calendar, which was described in the previous article. One half is used for plotting the machining work, the other half for the assembling work. The fixed vertical board placed in front of the drum contains the names of all the workmen employed on actual assembling. One name is placed opposite each circular strip on the drum. A plan of the revolving calendar is shown in Fig. 4. The workmen's names are grouped on the board in the same way as the men are grouped in the assembling shop, that is to say, in gangs, each foreman having charge of one gang.

The assembling work is plotted on the calendar in the following manner: Each assembling specification corresponds to a well-defined part of the work for which a certain number of hours has been allowed, say 30 hours for example. A strip of plotting paper as shown in Fig. 5 is cut to a length corresponding to 30 hours, and on that strip the following information is given: Order number, description of machine, operation, number, symbol of group workman's name and check number.

The strip is then placed on the calendar opposite the workman's name either in continuation or advance of the work he may already have in hand, the starting date corresponding to one end of the strip and the finishing date to the other. The starting date is written on the back of the workman's card as a guide to enable the clerk in the distributing office to place each card

on the distributing board, according to urgency, in such a way that the work is always given out in the same order as it has been plotted on the calendar.

When a workman finishes his work, he advises his foreman and the foreman advises the inspector who inspects the work. If all is correct, the inspector initials the workman's ticket and his copy of the assembling specification. The workman takes his specification and piece-work ticket to the distributing office where the distributing clerk looks on the piece-work card and specification to see if the work has been inspected, and if so, prints on the card the finishing date and time as well as the total time spent on the

ASSEMBLING SPECIFICATION

SHEET NO. 1 NO. 1

DESCRIPTION OF THE MACHINE 3 Rolls refiner type 40×80 ORDER NO. 358

NAME OF THE GROUP First motion shaft complete (2 sets) SYMBOL 2316-6-A

OPERATION NO.	DETAIL OF WORK TO BE DONE	CONSULT DRAWING NO.	TIME ALLOWED	TIME PASSED	TIME GAINED	RECORD	REMARKS
1	Assemble friction clutch complete and fix it in position on shaft. Fix driving pinion at the end of shaft, for correct position of pinion on shaft those dimensions given on drawing No. 2316. Fix key must be driven hard.	2316	3" per set	2.65" per set	0.36" per set		

SIGNATURE OF CHIEF PLANNER H.L. TOTAL TIME 5.3" 0.7"

DATE Nov. 9. 1921 WORK PASSED BY ASSEMBLING FLOOR FOREMAN

FIG. 2. ASSEMBLING SPECIFICATION

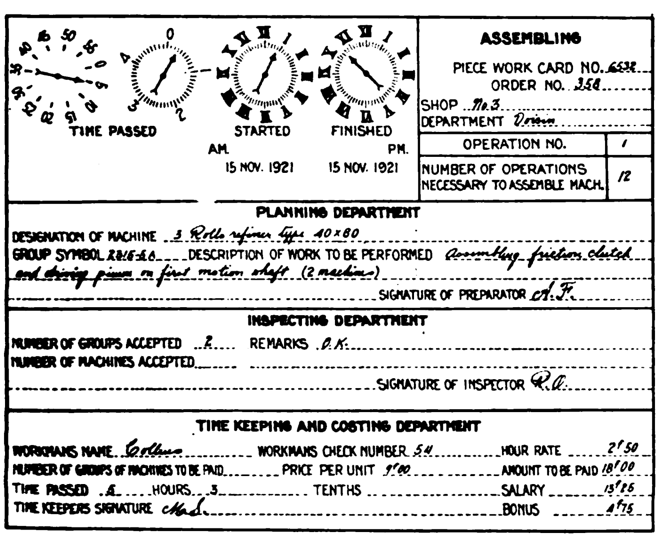


FIG. 3. PIECE-WORK CARD

job. This being done, the clerk gives the workman the specification and drawings for his next job, as well as the piece-work card with the starting date and time printed on it. The duplicate copy of the assembling specification can now be placed in the next pocket, marked work in hand.

The finished work cards are handed over to the progress clerk who keeps the progress sheets up to date; afterwards they are sent to the time-keeping department which finds thereon the necessary information to prepare the pay card of each assembler. From the time-keeping department the cards are sent to the prime-costing department, where is provided all the necessary information to work out the cost of assembling each machine manufactured in the works.

The assembling specifications are returned to the head of the planning department, filed in a special filing cabinet, and when all the assembling specifications for

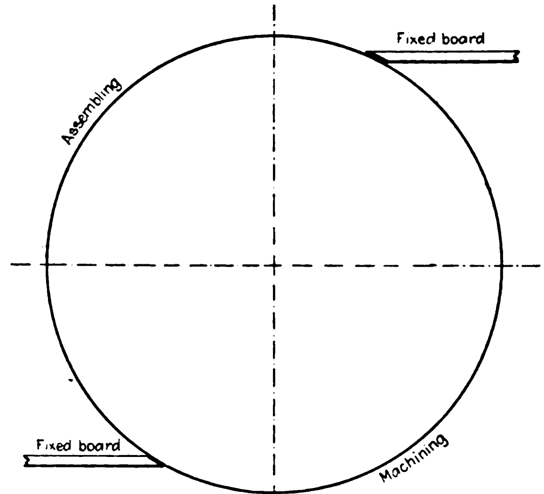


FIG. 4. PLAN OF REVOLVING CALENDAR

one machine have been filed, a summary giving the time taken for assembling the complete machine is made up on a special form, a copy of which is shown in Fig. 6.

This summary is made up duplicate, one copy is kept as a record in the planning department, the other

ORDER NO. 358-3-ROLLS REFINER TYPE 40X80 OPERATION NO. 2
ASSEMBLE SIDE FRAMES & SOLE PLATE BED BEARINGS GROUP SYMBOL
COLLINS NO. 54 2315 6-A

FIG. 5. THE PLOTTING STRIP

is sent to the prime-costing department and helps the cost clerk to collect all the piece-work cards which have been used to assemble any given machine and work out the cost of assembling. The system described has been in use for several months with the result that a

ASSEMBLING SPECIFICATION

SUMMARY

SHEET NO. NO.

ORDER NO.

DESCRIPTION OF THE MACHINE

OPERATION NO.	DESIGNATION OF THE OPERATION AND SYMBOL OF GROUP	TIME ALLOWED H	TIME ALLOWED M	MAXIMUM TIME H	MAXIMUM TIME M	MINIMUM TIME H	MINIMUM TIME M	AVERAGE TIME H	AVERAGE TIME M	LOT NO.	REMARKS
	BROUGHT FORWARD										
	TOTAL TO CARRY OVER							SIGNATURE OF CHIEF OF PLANNING DEPT.			

FIG. 6. ASSEMBLING SPECIFICATION (SUMMARY)

considerable amount of time and money has been saved on every machine assembled. It has also been found very easy to follow the progress and to give at any time the date on which any machine going through the assembling shop can be completed.

Ideas from Practical Men

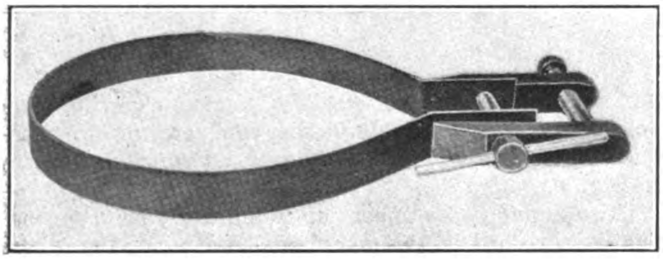
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

A Device for Contracting Piston Rings

By Harry Moore

The illustration shows how a pair of ordinary toolmakers' clamps, together with a piece of thin flat steel or strap iron, can be utilized to form a very good device for contracting piston rings.

The piece of steel is drilled near each end so as to pass over the inner screw of the clamp. In order to facilitate the working of the tool, a short piece of wire is driven through the hole in the head of the screw. Pressure is applied with the outer screw only, the inner one being used merely to keep the jaws in line and being adjusted for that purpose only.



A PISTON RING CONTRACTOR

The tool shown was one that I made for the purpose of squeezing a number of rings together while they were tightened in a special chuck preparatory to turning the periphery.

Jigs for Accurate Drilling and Reaming

By R. Grant

The castings illustrated in Fig. 1 are quite frail and in drilling holes through the bosses, are apt to spring so that the holes will not line up accurately. The jigs for drilling the holes, while of the conventional box form, had the bushings set and clamped in V-blocks, instead of being driven in holes. The V-blocks were hardened and ground and clamped in grooves planed in the jig bodies. Drill bushings were readily distinguished from reamer bushings by a small groove ground around the middle.

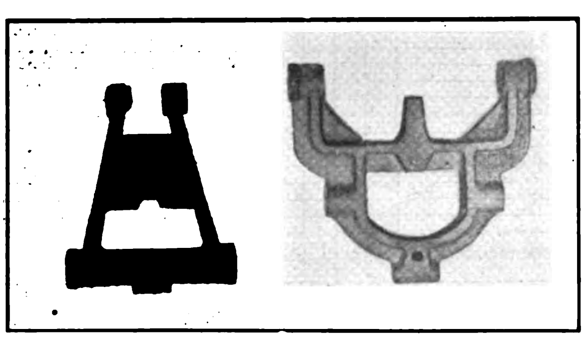
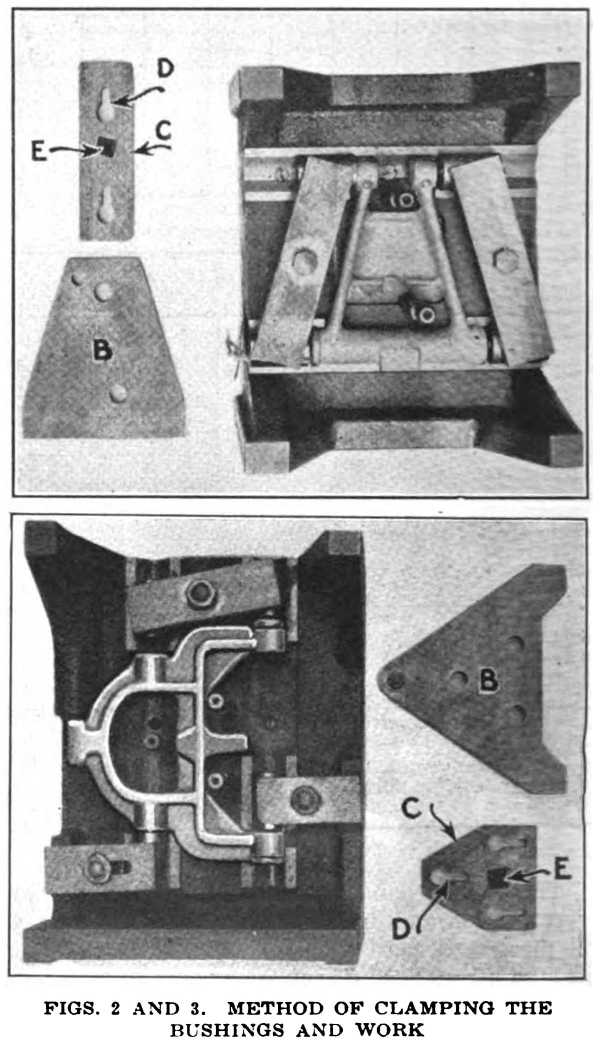


FIG. 1. THE WORK TO BE DRILLED AND REAMED

All bushings were interchangeably used in a number of jigs of similar design, thus reducing the quantity of bushings needed to the minimum.

The method of clamping the bushings in the jigs is shown in Figs. 2 and 3, which also show the work in position but not clamped. For clamping the work, the equalizers B and clamp plates C were used in the following manner: The equalizers were placed over the work on which they bore at points directly over the work-support points, being located by studs in the jig base. The clamp plates C were provided with keyholes as at D, and were set over the equalizers, the studs passing through the round parts of the keyholes. Flats on the sides of the studs below the ends permitted the clamp plates to slide on the studs, the flats engaging with the elongated part of the keyhole and holding them in position against pressure in line with the studs. When in this position, tightening the central screws E clamped the work through the equalizers.



FIGS. 2 AND 3. METHOD OF CLAMPING THE BUSHINGS AND WORK

In some cases the holes were drilled through from one side of the casting, while in others the drilling was done from opposite sides. In operation the jigs rested on sub plates provided with leveling screws and were trammed up from the drilling machine spindle until practically dead true, so that a satisfactory degree of accuracy was attained.

A Shop Man's Method of Figuring Change Gears

BY GEORGE HEALD

On page 678 of AMERICAN MACHINIST, W. G. Andrews submits a method of figuring compound gearing which is, as he says, "simplicity itself," but I am impelled to make the same criticism of it as he aims at the method outlined by J. Crommel in an earlier issue—that it does not go far enough.

His method is applicable to all lathes that are geared even; that is, when the gears on the main spindle and on the inner end of the stud have the same number of teeth. If these two gears have different numbers of teeth then the pitch of the leadscrew cannot be used as the numerator of the fraction.

On an even-geared lathe, equal gears on the stud and leadscrew will cut a thread of the same lead as the leadscrew. If, on the other hand, the fixed gear on the stud should have twice as many teeth as the corresponding gear on the main spindle, equal change gears placed on stud and leadscrew will produce a thread that has twice as many turns per inch as the leadscrew.

On an uneven-geared lathe the proportion would be as follows: *As the lead of the thread that will be cut with even gears, is to the lead desired to be cut, so will be the number of teeth in the change gear upon the stud to the number of teeth in the corresponding gear upon the leadscrew.*

There is still another complication. On a lathe that carries two gears upon the intermediate stud in a ratio of 2 to 1, 3 to 1, etc., the factoring must be done so that one of the fractions obtained will be of the same ratio.

Take the first example cited by Mr. Andrews; ratio 2 to 1, leadscrew 4, thread to be cut 40. Factoring, we have $\frac{4}{40} = \frac{1 \times 4}{5 \times 8}$. Since the fraction $\frac{4}{8}$ is of the ratio 2 to 1, the same as that of the intermediate gears, it need not be carried further. Multiplying $\frac{1}{5}$ by 20 we have $\frac{20}{100}$ as the gears required.

Formula for Tap Drill Size

BY J. R. OWENS

Most formulas for determining the tap drill sizes for threaded holes are difficult to remember. Here is one that is easy, both to keep in mind and to apply. Though it may be old, I have never seen it in print and it may serve to help some of the younger members of the fraternity. It applies to the U. S. F. thread and is recommended only for the ordinary run of work that does not require exact figuring.

Subtract the fraction represented by the pitch from the nominal size of the tap.

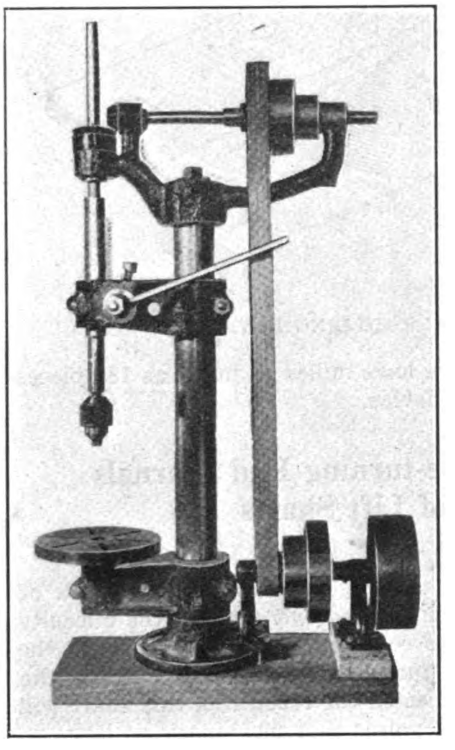
Example: Tap, $\frac{1}{2}$ in., 13 pitch: $\frac{1}{2} - \frac{1}{13} = 0.500 - 0.077 = 0.423$ = size of tap drill.

Home-made Drill Press

BY M. SHUTT

Having need for a small drill press for my shop and having more time than cash at my disposal last winter, I decided to capitalize some of the surplus time by building the machine. The result, as the accompanying cut will show, is a good, serviceable machine at a nominal cost.

Only four patterns were required. One is represented in the top casting that carries the bearings for the upper horizontal shaft and upper end of spindle; one for the two brackets, alike, that support the quill and the work table respectively; one for the base of the machine; and one for the two pedestals, also alike, in which the lower horizontal shaft runs. The column is a piece of 3-in. cold-rolled shafting; the bevel gears were from the differential of a wrecked automobile and needed but little machining to fit them for their new duties; the cone pulleys were built up from thin sections of hard wood and provided with steel collars setscrewed to the shafts; and the table was the faceplate of a 12-in. lathe, fitted to a hollow stud that screws into the plate and is turned to fit the hole bored in the end of the bracket. One advantage of this construction is that any chuck that fits the lathe will also fit the drill press and may be put in position as readily upon the one as upon the other.



A HOME-MADE DRILL PRESS

Both ends of each bracket are split and provided with clamping screws, so that either may be moved up or down on the column, or the table turned around or swung to one side. The pattern for these brackets was provided with suitable bosses so that a power feed could be added whenever I have the time and ambition.

A 1¾-in. plank forms the foundation of the machine, to which the base and the outboard pedestal are lagged. The driving pulleys and the feed rack were the only other castings used, and these were found in the accumulation of odds and ends that represent no negligible part of the assets of the small repair shop. All other parts were made from bar stock and most of them required little machining.

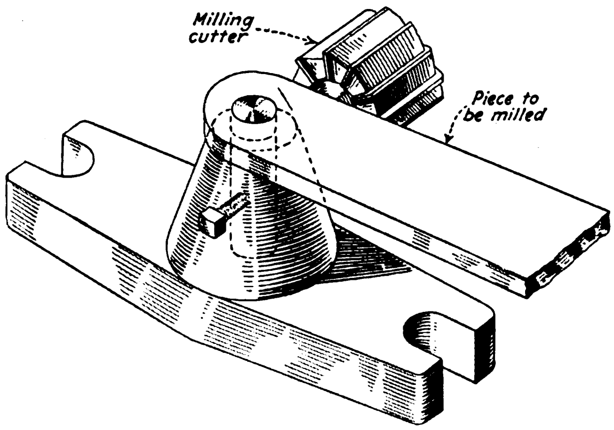
The spindle has a No. 2 Morse taper hole and is fitted with a chuck to hold drills up to $\frac{1}{2}$ in. Above that size standard taper shank drills up to 29/32 in. are accommodated. The machine will drill to the center of a 15-in. circle and the maximum distance from the table to the lower end of the spindle is about 12 inches.

Simple Radius Milling Device

By Joseph J. Sanders

The sketch shows a simple milling fixture that has been in use in our factory for some time for milling the radius on the ends of small links.

The links are set over the stud as shown and swung



RADIUS MILLING DEVICE

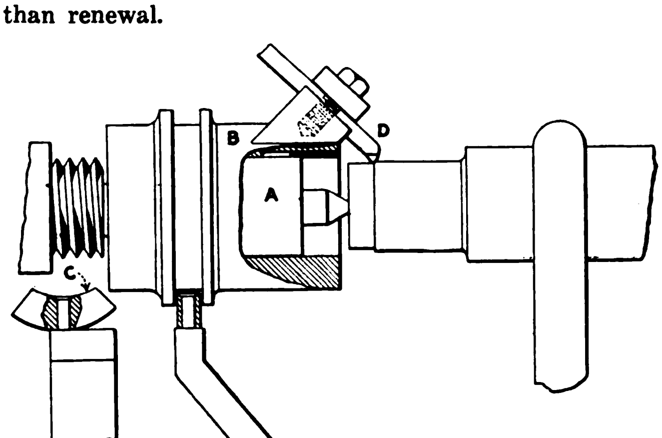
around by hand. We have milled as many as 180 pieces an hour with this device.

Tool for Re-turning End Journals of Lift Shafts

By F. M. A'Hearn

In repairing the valve gear of locomotives one of the jobs that is often slighted by reason of the difficulty in handling it, is the re-turning of the journals at the ends of a lift, or tumbling shaft. Because of the arm to which is connected the reach rod, this shaft will not swing in a lathe unless that machine is so large as to be out of all proportion to the work to be done. A not uncommon practice is to heat and bend the reach rod arm parallel to the shaft, so that the latter will swing in a comparatively small lathe; then to straighten it again after the turning is completed.

Many times this work is neglected entirely. The renewal of the bearings in the lift-shaft stands are considered sufficient, regardless of the slack that soon develops, resulting in needless vibration and hammering at this point. This is particularly liable to occur in valve motions of the Stephenson type, in which the lift shaft is swung upon rather short bearings supported by the main frames, with no means of adjustment other than renewal.



TURNING END JOURNALS OF LIFT SHAFT ARMS

The tool shown in the sketch has been in service for some 15 years and the writer is often asked for sketches or drawings from which it may be duplicated in other shops.

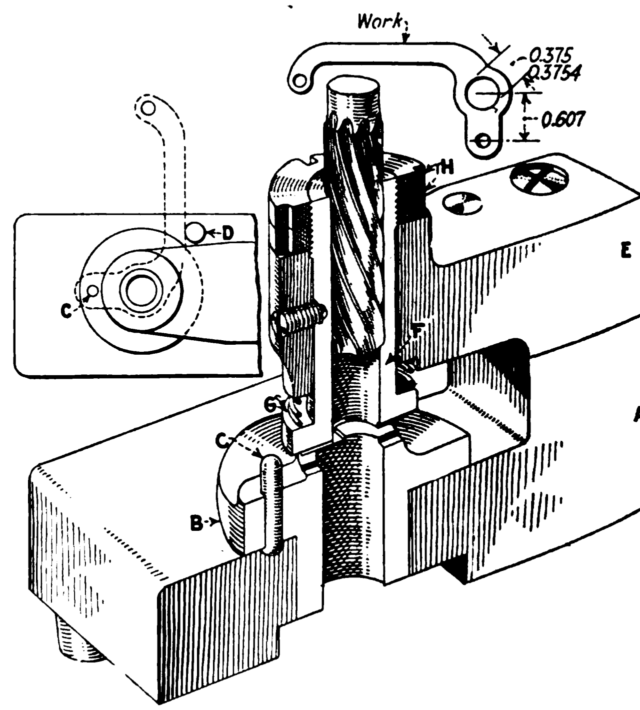
The arbor *A* may be bored and threaded to fit the spindle nose or, as is probably more convenient, provided with a taper shank to fit the center hole. The sleeve *B* slides freely upon the arbor and is driven from it by means of a feather. A stud, driven in the end of a tool shank and fitted with a short swiveling block *C*, to enter the groove in the sleeve, provides for the feed movement.

The lift shaft is placed upon centers with the reach rod arm resting upon a block of wood on the lathe shears, the tool shank fastened in the toolpost of the carriage, and the toolbit *D* adjusted to the cut. The operation should be quite obvious from the sketch.

Jig for Reaming Small Parts of Sheet Metal

By C. Stevens

The jig in the accompanying drawing is used to ream a hole 0.375 in. in diameter in a small lever made of cold rolled steel of 0.078 in. thickness. It is necessary that this hole be square with the surface, round,



JIG FOR THE ACCURATE REAMING OF THIN PARTS

smooth, and to size within a tolerance of — 0, + 0.0004 inch.

A standard spiral fluted reamer is used, the flutes running parallel to the axis of the reamer for a distance of ⅛ in. at the entering end. As many as 50,000 holes have been reamed with one reamer, all being within the 0.0004 in. limit and as smooth as glass.

The body of the jig *A* is made of machine steel. It is bored to receive the hollow plug *B*, in which is the locating pin *C*. This plug is of tool steel, hardened, and with its upper surface ground parallel to the base of the jig. Another locating pin *D* in the body of the jig serves to prevent the work from turning with the reamer.

The bracket *E* is of tool steel and is fastened to the body by means of fillister head screws and dowels.

A guide bushing *F*, hardened, ground, and lapped, is a sliding fit in the bracket, and its internal diameter is as close a fit to the reamer as is practical.

The under side of the bracket is counterbored to form a cell for the spring *G*, which bears against the shoulder of the bushing *F* and thus exerts a pressure upon the work as the latter is pushed under it. The height of the bushing is determined by the position of the lock collars *H* so that the opening between the bushing and the hollow plug *B* is a trifle less than the thickness of the work.

The jig is clamped to the table of a drilling machine with the reamer bushing in line with the spindle. A small pump added to the equipment of the machine keeps a stream of oil on the reamer and washes away the chips.

Repairs by Electroplating

By F. H. Sweet

In reference to the discussion in American Machinist as to the practical value of electrical depositions of metal to compensate for wear, I would say that in many cases worn parts can be restored to their original dimensions by this method. Nickel is good for this purpose because of its hardness.

The part should be thoroughly cleaned and dipped in melted wax. When the film of wax has cooled it is scraped away from the surfaces which require treatment, and the part immersed in the plating bath. As the metal is deposited very slowly it is easy to work to very close limits; yet, if sufficient time be allowed, the deposit may attain a thickness of $\frac{1}{16}$ in. or more.

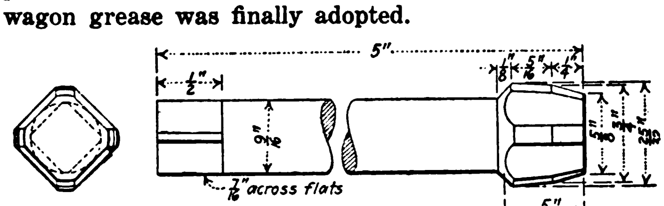
If the operation be properly carried out the nickel adheres to its foundation very tenaciously and is quite continuous and of even thickness throughout. In this way expensive and heavy pieces, such as crankshafts, cylinders and pistons can be made serviceable again at a cost far smaller than that of a new part. At the other end of the scale very slight wear in delicate machinery, in which close adjustment is essential, may be put right by the deposition of a film of the exact thickness required.

Simple Tube Expander

By J. Greig

The accompanying sketch illustrates a tube expander which was successfully employed where brazing or sweating were prohibitive, metal to metal joints being the requirements, and no other form of tube expander at hand. Apart from its usefulness, its simplicity and cheapness will appeal to most readers. The tubes to be expanded were $\frac{3}{4}$-in. internal diameter.

At first the expander was driven by hand, but progress was very slow and the work laborious, so it was decided to use it in a vertical drilling machine with the assistance of a tap driver. This was successfully accomplished and after experiment with various lubricants, wagon grease was finally adopted.

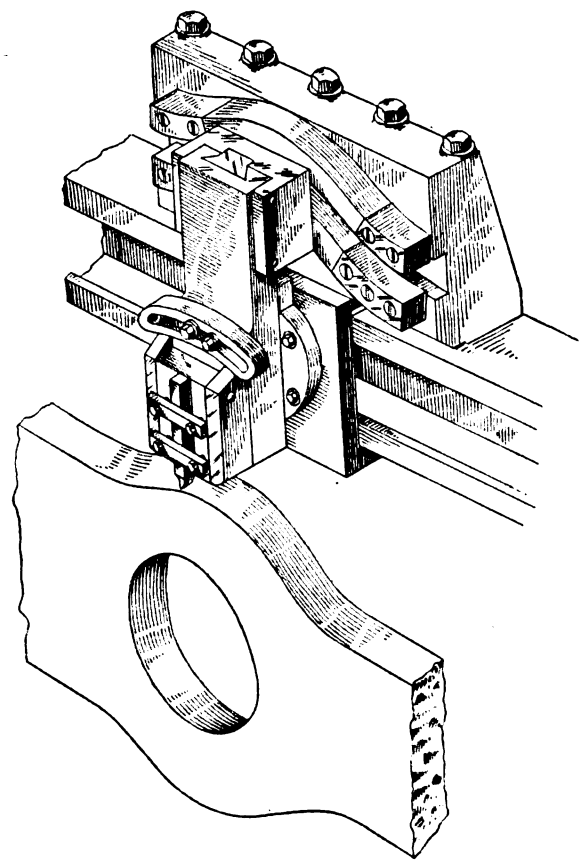


SIMPLE TUBE EXPANDER

Radius Planing Device for Stern Posts of Ships

By Alonzo G. Collins

When the cry from Uncle Sam was for "ships" and "more ships," a planer hand was making bad weather of the job of manipulating two feed screws on a 7-ft.


METHOD OF PLANING CURVES WITH CAM DEVICE ATTACHED TO PLANER

planer in an endeavor to coax the point of the cutting tool to follow the designer's curves around the propeller shaft bearing-hub of a cast-steel stern post; and as the handles of said feed screws were at times nearly 7 ft. apart, the planer hand was in a fair way to qualify as a mountain climber, even if he did have the longest reach of any man in the shop.

It soon developed that this method was not getting the production desired, and the writer was called upon for help. The device shown in accompanying drawing was the result, and when it was installed the effect on the planer hand was such that he was enabled to catch up on the baseball news in his favorite paper.

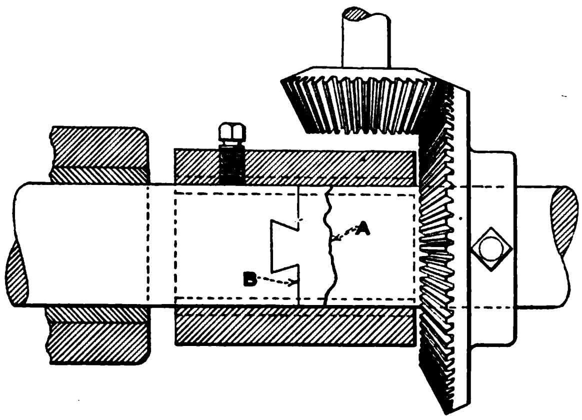
The drawing is almost self-explanatory, but I will add that the cam bracket was attached to the cross-rail of the planer by five $1\frac{1}{2}$-in. screws, and the cam roller bracket was attached to the upper end of the toolslide with eight $\frac{5}{8}$-in. screws. The down-feed screw in the saddle was removed, leaving the toolslide supported and controlled by the cam roller in the cam slot as the saddle was fed across the work by the regular cross-feed screw.

Owing to the difference in shape of the stern post on opposite sides of the center, it was necessary to make two cams, as when the work was turned over the relative positions of the curves were reversed.

Repairs to Crankshaft of Motor Boat

By C. M. May

The crankshaft of a four-cylinder, two-cycle engine, used on a motorboat broke at point *A* shown in the accompanying sketch, and because of the position of



JOINING A BROKEN CRANKSHAFT

the miter gears (which drove the magneto) a flange coupling could not be placed at this point to join the broken ends.

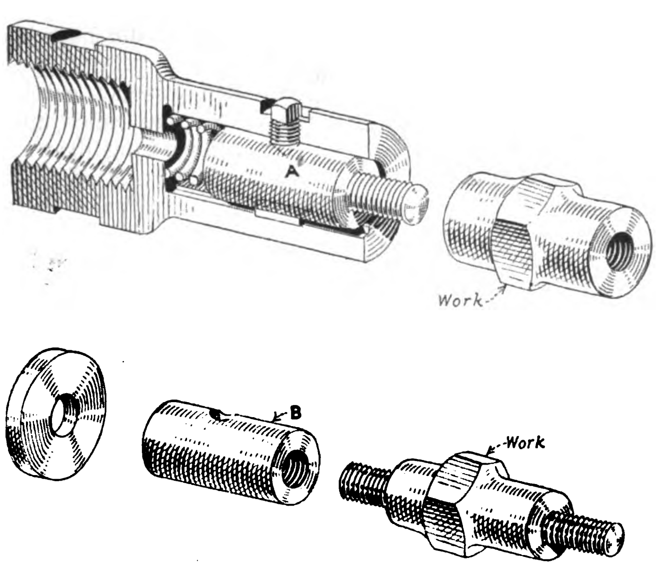
I sawed off the shaft at the point *B*, squared it up and cut the dovetail as shown. A new piece of 2-in. shaft was correspondingly dovetailed to fit and a cast-iron bushing bored to drive over the joint. Two keys, shown by dotted lines in the sketch, assisted in the driving and the bushing was prevented from moving endwise by two small setscrews.

The boat has been in daily service for six months and the shaft has given no further trouble at the joint.

Second Operation Chuck for Brass Turners

By Thomas W. Airey
Gainsborough, England

A very handy and easily made chuck to hold small threaded parts for second operations is shown in the accompanying illustration. It is especially serviceable to brass turners. The feature of the chuck is the ease with which the work can be released after it is finished.



BRASS TURNINGS FOR USE IN SECOND OPERATION CHUCK

The shell of the chuck is threaded to screw on the spindle nose of the lathe in the usual way. The outer end of the shell is bored and finished true and smooth to take the stud pin *A*, which should be hardened. A feather in the stud pin engages with a spline in the shell, so that both parts must rotate together.

A somewhat sharp pointed setscrew through the shell enters a corresponding depression or countersink in the stud pin and should be set up tightly before placing work on the chuck.

After the work on a piece has been completed, instead of getting a wrench to release it just loosen the setscrew slightly. The spring back of the stud pin will push the shoulder of the work away from the end of the shell and the work may be spun off the thread with the fingers.

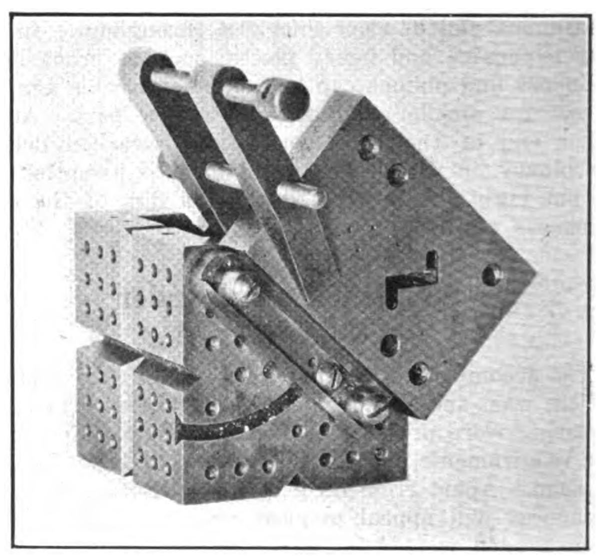
Stud pins of various sizes and threads may be made to adapt the chuck to a variety of work. A bushing with a threaded hole instead of the stud pin, but having otherwise the same characteristics, as at *B*, accommodates work having a male thread. If the shoulder of the work is smaller than the hole in the end of the shell, a carefully faced steel washer may be used between them.

A Handy Sine Bar Block

By Joran Kyn

A block for use on the surface plate in connection with a sine bar and on the usual laying out tools contained in a toolmaker's kit, is a very convenient article.

Such a block is illustrated herewith and it will be



HANDY SINE BAR BLOCK

seen that numbers of tapped holes are provided for the attachment of a sine bar in all sorts of positions. Accurate V-grooves in all faces afford an opportunity for holding punches and other tools with round shanks while laying off other parts to give lines for machining.

With the sine bar pivoted by a screw at the upper end and provided with a clamping bolt to engage in the circular dovetailed slot, as shown in the illustration, the bar can be swung and clamped at angles not provided for by any of the tapped holes. The block shown herewith is in use in the shops of the Phono Parts Corporation, 124 Pearl St., Brooklyn, N. Y.

Editorial

Keep On Coming Back

"IF THINGS keep up the way they were last month we'll begin to feel as though we were in the machinery business again." This remark from a machine tool builder who dropped in the office this morning is typical of the sentiment in many directions these days.

The automobile industry, probably the biggest machinery buyer of all, had its banner month in May when it turned out over 250,000 cars. A good deal of the material that went into those cars was purchased recently and at the bottom of the market, and as a result balance sheets at the end of June, 1922, are going to be far more cheerful than those of June a year ago.

Manufacturers of motor cars know better than to expect the early season rush on touring cars to continue, but they also know that the average car owner has set his heart on having a closed car "next time" and they are getting ready for the fall weather when glass windows and a solid roof look pretty good even to the most confirmed dust eater.

Other branches of the machinery industry have not been so fortunate as the transportation suppliers but they have also felt the revival of trade and are becoming busier. They may not have the closed car trade to look to and produce for next fall but there is likely to be something in their particular field that corresponds if they are wise enough to recognize and go after it.

Summer is on us with the vacation season and the vacation spirit. By all means take the recreation and rest that you need to keep you in good trim, but don't let your business take a vacation just because it is summertime. It is a pretty poor organization that slows down when the boss is away. The scheme of having under-studies for every job is a pretty satisfactory one when the hot weather comes and key men need a little time off occasionally to keep them fit. Trained substitutes are anxious and able to make a showing.

We have started to come back, let's keep on coming in spite of the weather and the season.

Forced Lubrication and Scored Bearings

THE letter on another page of this issue on the observations of a service station mechanic as to the scoring of bearings of motors which have a forced oil feed, is worth the consideration of designers of all kinds of machinery. There is an undoubted tendency toward forced lubrication and there seems to be much in its favor. If, however, the experience of repair men is that such bearings score more frequently than bearings lubricated by the splash system, it is up to us to find the reason.

There seems to be but one remedy and that is a more careful attention to the purity of the oil used. The old idea of securing economy by saving in lubricating oil, seems to be severely jolted by this letter. There can be no question as to the value of lubrication obtained from a constant and copious supply of clean oil forced between the bearing surfaces. If this method of lubrication causes scored bearings it can only be because the lubricant carries with it impurities of such a nature as to cut the surfaces between which it is pumped.

The remedy does not seem to be in abandoning forced lubrication but in providing better methods of insuring that the oil forced to the bearings shall be free from abrasive substances. Better filter screens and a more frequent changing of the oil would seem to be the answer rather than a return to splash lubrication.

Those who have studied this question carefully can testify to the rapid accumulation of fine particles in the oil. This is readily seen as a discoloration and felt between the fingers as a sort of sludge. While it does not feel especially gritty, it is certainly not a lubricant and its effect in motor bearings indicates that it has a cutting action which scores both crankshafts and bearings.

Useless Patents

THERE are two arguments for monopoly patents—to prevent a competitor using a device which may be vital to your business, or to enable you to manufacture and market it at a profit. The reason for the first is apparent, but the only justification for the latter is the existence of a sufficient market to make it a profitable undertaking. And in too many cases this is not carefully considered.

There are many instances where a mechanic devises a new tool or machine which aids greatly in getting out production. Considering only the returns which a few inventors have secured, they spend their good money for a patent without stopping to canvas the probable sales and the cost of getting it into the hands of the user. This seems to be particularly true of the men in railroad shops, although it may be that more such cases have come to our attention.

There are two serious objections to these ill advised patents. They waste the money of the inventor and they prevent the use of tools which would be of considerable benefit to the country at large, could they be used in even the comparatively few shops for which they are fitted. This is a case where the payment of a small royalty by whoever cared to use the device would benefit all concerned.

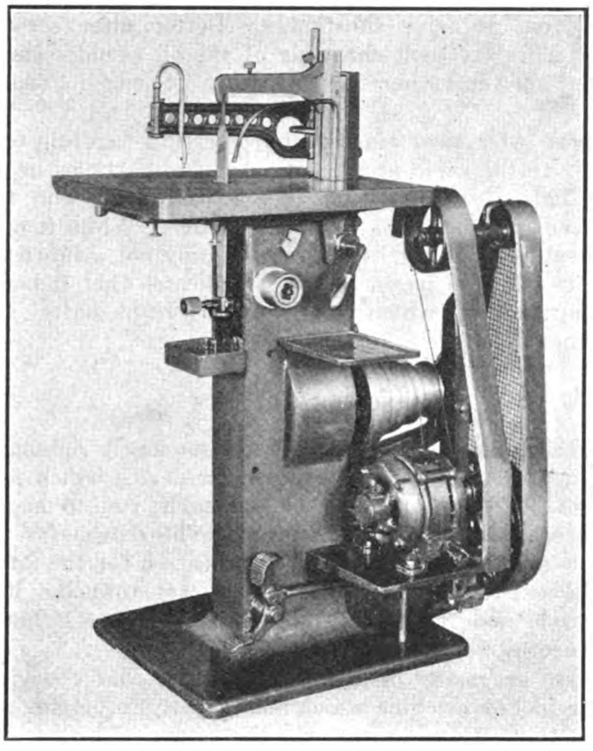
Anyone who contemplates spending money on a patent with a view to profiting thereby, should first carefully consider the possible market and then the percentage of this which can probably be secured. He should count carefully the cost of selling which is very frequently much more than the actual cost of manufacture. This will in most cases be sufficient to deter him from spending the money for a patent, especially if he has secured the advice of a good salesman as to the cost of marketing.

Eliminating even ten per cent of the patents which cannot possibly pay a suitable return would save the inventors thousands of dollars and greatly relieve the congestion of the patent office.

Shop Equipment News

Oliver High-Power Filing Machine

The Oliver Machinery Co., Grand Rapids, Mich., has recently brought out the large-capacity high-power filing machine that is herewith illustrated equipped



OLIVER HIGH-POWER FILING MACHINE

with a motor drive. The main column is a casting having a wide flange to form the base. A large tool shelf is fastened to the column, as well as a removable box for catching filings.

The length of the stroke is adjustable by means of an eccentric inside the column that is easily accessible. This eccentric is connected to the vertical sliding mechanism by means of a telescoping connecting rod, which permits the use of files from 3 to 14 in. long. The four-step cone pulley is directly connected to the eccentric shaft. The moving parts are balanced by a counterweight so as to give smooth operation.

The table measures 20 x 24 in. and is provided with diagonal grooves for filings. It tilts for draft or clearance in all four directions. The work-clamping arm swings over the table and the pressure with which it holds the work down on the table can be regulated. The work may easily be forced against the file by the operator without danger of it being lifted with the file and thus injuring the operator's fingers.

The head has an arrangement of a cam inside of the cone pulley to relieve the file $\frac{1}{32}$ in. on the up stroke, thus lengthening the life of the file. A pump having a swinging nozzle blows the filings from the point of contact of the file and work.

The slide is 18 in. long and is made of machine steel, with the lower arm of cast steel welded to it. Provision is made for adjusting the lower arm, so as to line up the file to make the cutting edge parallel with the finished surface desired on the work. The slide is driven by means of a four-step cone pulley that gives speeds from 80 to 320 strokes per minute. The length of the stroke is adjustable from $\frac{1}{2}$ to 7 inches.

The machine can hold and drive files from a 3-in. needle size to a 14-in. bastard, either standard or special. Although work up to 9 in. high may be filed, for constant filing 6 in. should be taken as the maximum work height.

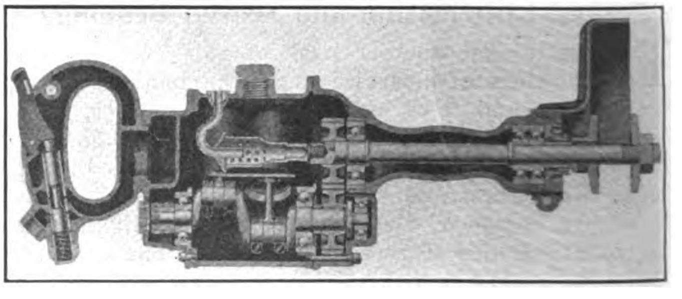
An overhead support arm for filing closed-bottom dies can be furnished, and also a lower support clamp for use in filing closed-top dies. A sawing attachment consisting of upper and lower arms for holding hacksaws can be fitted. By means of a toting truck the machine can be made portable.

The motor required has $\frac{1}{2}$ hp. at 1,800 r.p.m. It can be mounted as shown and belted to the speed-reducing jackshaft that has a yoke support. Thus the outfit is self-contained. The floor space required is about 22 x 38 in. and the weight about 700 pounds.

Developments in Chicago Pneumatic Grinder

The Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y., has recently made some changes in the design of its pnuematically operated portable grinder. A wire brush for use in place of a grinding wheel has been developed. The brush makes the equipment applicable to such work as removing rust, paint and scale from steel and iron surfaces. It consists of a $\frac{1}{8}$-in. steel back plate dished so as to better retain the wires, and a $\frac{1}{8}$-in. front plate having a series of slots through which the wires extend. The wires are grouped in thirty renewable units of heat-treated crucible steel.

Particularly when used with the wire brush, the air motor is required to deliver continuous service. In



CHICAGO PNEUMATIC GRINDER WITH OIL SEPARATOR

order that the bearings may be better lubricated and need oiling only occasionally, an oil separator has been fitted to the grinder. The device enables continuous service for 48 hours, or even longer, without replenishing the supply of lubricant.

As can be seen in the accompanying sectional view

of the grinder, the oil separator consists of a perforated cylindrical steel shell attached to the inner end of the grinding spindle. This shell revolves around the vent tube, and the oil-laden air leaving the motor passes through the holes in the shell. The centrifugal action causes the oil to be separated from the air and thrown back into the mechanism. The air then escapes free from oil. The separator is applicable to the larger sizes of the "Little Giant" grinders.

Ettco High-Speed Tapping Attachment

The Eastern Tube and Tool Co., 594 Johnson Ave., Brooklyn, N. Y., has recently placed on the market the sensitive, high-speed tapping attachment that is shown in Fig. 1. The device has a capacity of 3/16 in. in steel and 1/4 in. in cast iron or brass. Its extreme light weight should be noted, as the complete unit weighs only 3 3/4 pounds.

The tapping spindle is driven through friction clutches on both the forward and the reverse motion. The friction drive on the reverse motion is of especial importance, because of the fact that taps are frequently broken when backing out of the hole.

The arrangement of the mechanism can be seen in Fig. 2. The shank in the spindle of the drilling machine drives directly the upper cast-iron cone. This cone carries a gear that drives the train of gears operating the lower cone. Thus, both cones are driven at the same time, although in opposite directions. Between the upper and lower cones is a third conical member faced with leather on both sides. This cone is mounted on the spindle driving the tap by means of an Oldham coupling, so that it is free to center itself on the two other cones and does not tend to throw the spindle out of alignment when driving.

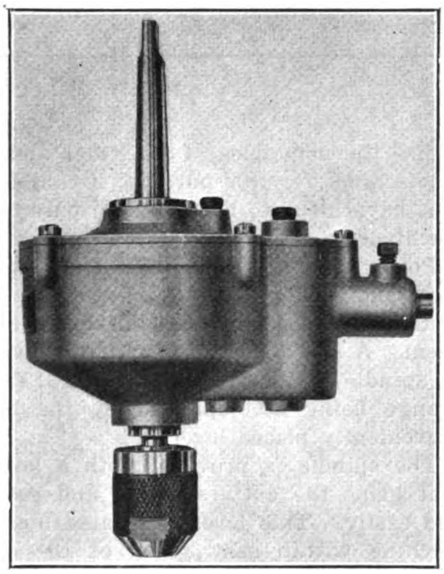


FIG. 1—ETTCO HIGH-SPEED TAPPING ATTACHMENT

The tapping spindle is fitted over a projection on the shank for most of its length, so that it is held in alignment. In addition, it is carried and supported in a bearing in the lower half of the aluminum housing. Both the upper and the lower bearings can be easily oiled, and the oil cannot reach the leather friction surfaces. The journals are hardened and ground, and run in phosphor-bronze bearings. It should be noted that the thrust of the cut is transmitted directly back to the spindle of the drilling machine, without being carried by the housing of the attachment.

When the drilling machine is running idle, the tap is naturally rotated in the reverse direction, since the driven friction cone rests on the bottom driving cone. As soon as the tap is brought to the work, a movement of 1/16 in. upward brings the driven cone in contact with the upper driving cone, which drives the tap while it is cutting the thread.

The speed of the tap can be easily regulated by the pressure placed on the drilling machine spindle. As soon as the tap encounters an obstruction, the clutch slips and prevents breakage. When the bottom of the hole has been reached and the drilling machine spindle is raised, the driven cone comes in contact with the lower driving cone, and is caused to run in the reverse direction at a speed twice that of the forward speed.

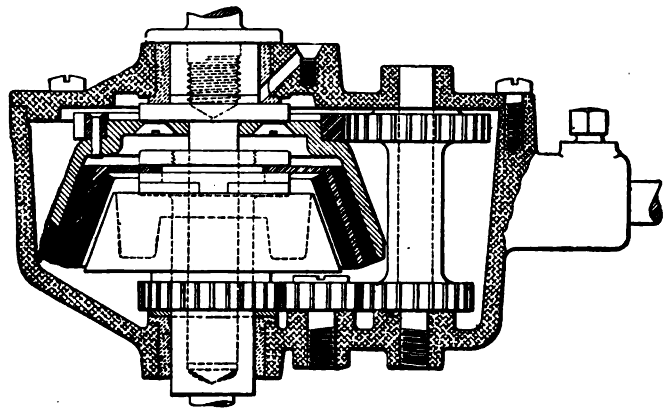


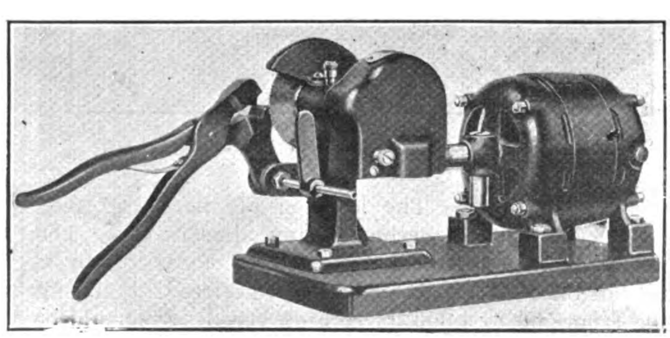
FIG. 2—SECTIONAL VIEW OF ETTCO TAPPING ATTACHMENT

A rod in the housing prevents the device from rotating with the spindle of the drilling machine. A special type of tap-holding chuck that provides a slight play for the tap is provided. This chuck gives additional protection against breakage, as it permits the tap to follow the drilled hole, in case the spindle is not in exact alignment with that hole. The entire unit is only 5 1/4 in. in height from the nose of the chuck to the spindle of the drilling machine. The smoothness of operation is stressed by the maker, as well as the speed and the safety with which the holes can be tapped.

Triangle "Rapid" Bench Saw

The portable bench saw shown in the accompanying illustration for cutting small metal stock has recently been developed by the Triangle Metal Products Corporation, 31 Dartmouth St., Rochester, N. Y. The saw is made in two sizes, the No. 1 machine being intended to cut metal from 1/8 to 1/2 in. in diameter and the No. 2 from 1/2 to 1 in. in diameter. The saws used are interchangeable.

A 1/8-hp. 110-volt enclosed motor arranged for either a.c. or d.c. to suit the type of current available, drives the saw through a worm gearing. The speed of the saw is ordinarily 110 r.p.m., although it can be made



TRIANGLE "RAPID" BENCH SAW

greater for cutting soft material such as brass and copper. The circular saws are $\frac{1}{32}$ in. in thickness and $3\frac{1}{2}$ in. in diameter. They are hollow-ground, so as to provide clearance for the teeth. The saw is covered by a guard. Due to the thinness of the saws, very little stock is wasted in the cutting-off operation.

The work-holding device is equipped with handles that permit of very rapid operation and clamping. The device clamps and holds either round, square or hexagon stock without any change in the arrangement. A stop for adjusting the length of the piece cut is also provided.

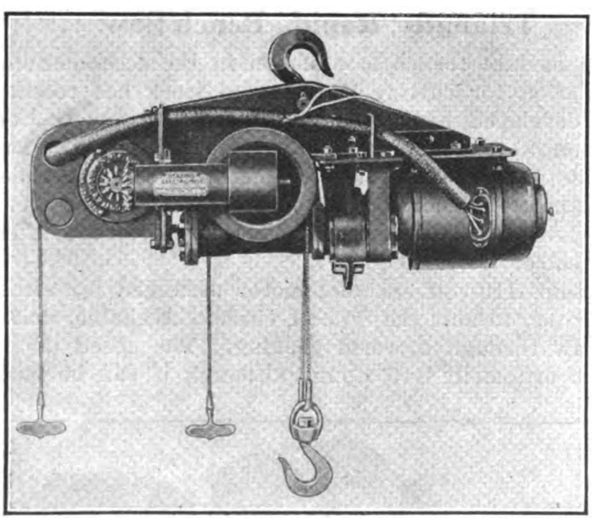
It is stated that $\frac{1}{2}$-in. round cold-rolled steel rod can be cut through in 30 sec. and $\frac{5}{8}$-in. round brass rod in 5 sec., and that brass rod $\frac{3}{16}$ in. in diameter has been cut at the rate of 18,000 pieces per hour. The weight of the machine complete is 40 pounds.

Reading Type-S "Everedy" Electric Hoist

In the accompanying illustration is shown the Type-S "Everedy" electric hoist that has recently been placed on the market by the Reading Chain and Block Corporation, Reading, Pa. The hoist is intended especially to replace hand-power chain hoists, and for this reason it is light in weight and runs at rather high speed. It is stated to be substantial and rugged enough to withstand continuous service, and it has a guaranteed over-load capacity of 50 per cent.

The hoist is very similar in construction to the other electric hoists made by the concern. It is equipped with a mechanical motor brake which operates in conjunction with the control lever. It has an automatic limit stop that acts at both the bottom and top limits of the movement and is adjustable for any desired height of lift.

The hoist is balanced, so that the lifting hook is always central with the point of suspension. The rope is guarded to prevent over-winding. The gears are packed in grease and the bearings are protected to

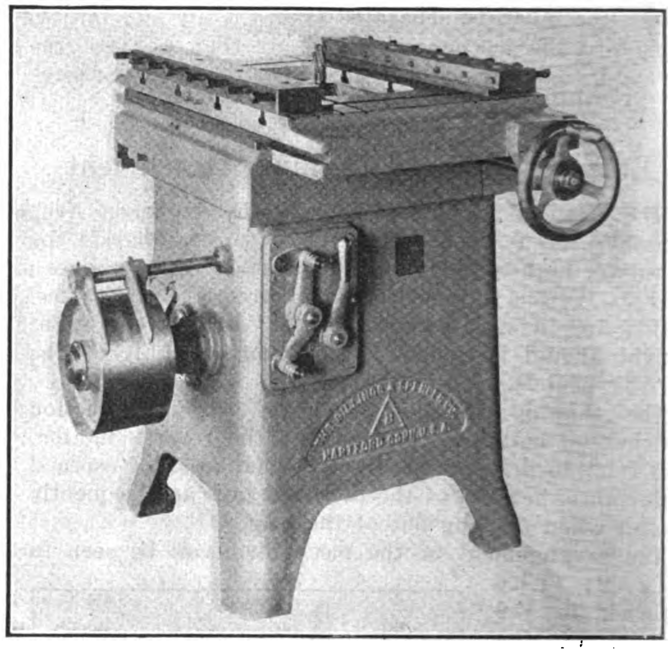


READING TYPE-S "EVEREDY" ELECTRIC HOIST

prevent loss of oil. The location of the motor may be observed in the accompanying illustration. The hoist may be controlled by pendant cords or by a push-button switch. It is made in sizes for lifting loads from 500 to 4,000 lb. at high speed. It should be noted that the hoist requires very little head room.

Billings & Spencer Die-Milling Machine

The Billings & Spencer Co., Hartford, Conn., has developed a machine for milling dies and similar kinds of work of irregular outline. Though the machine em-



BILLINGS & SPENCER DIE-MILLING MACHINE

bodies the principles of the older and well-known type of machines for this purpose, it contains many features that have hitherto been applied only to other classes of machinery.

Power may be transmitted from the lineshaft to the tight and loose pulleys of the constant-speed drive shaft of the machine, which should run at approximately 300 r.p.m. A speed-change gear box provides four changes of spindle speed ranging from 281 to 926 r.p.m., the change being accomplished by the movement of two conveniently placed levers.

The spindle is provided with a lever-operated collet that grips the cutters firmly and yet releases quickly and easily. This lever is located upon the side of the machine within easy reach of the operator. Special collets are provided with each machine to hold cutters with shanks $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ and 1 in. in diameter. Cutters may be so held as to permit any degree of draft.

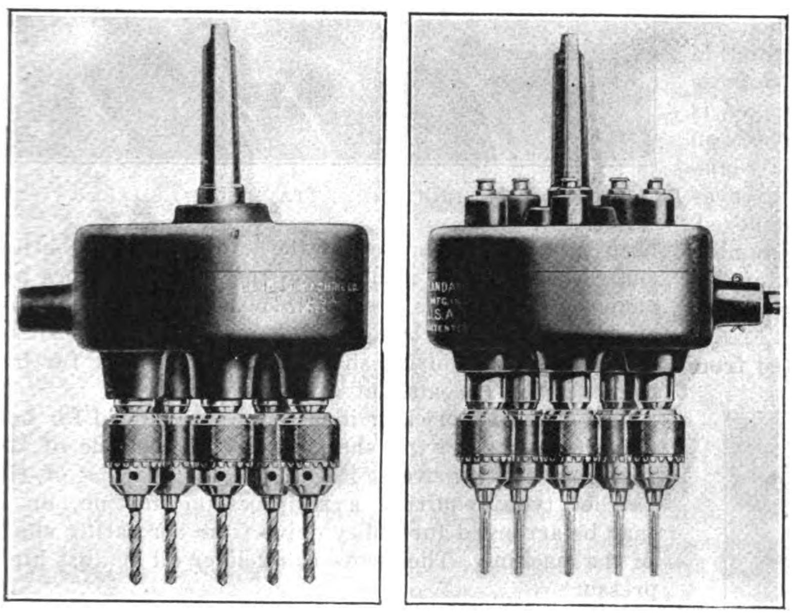
A double sliding carriage forms the upper part of the machine, upon which may be clamped dies or other work from $3\frac{1}{2}$ to $17\frac{1}{2}$ in. wide and of any length. This carriage permits a traverse movement of 12 in. and a cross movement of $4\frac{1}{4}$ in. Either movement may be operated independently or in conjunction with the other, and the actuating screws are provided with graduated dials by means of which close measurements and adjustments may be obtained. The slides are of the square lock gib type, so that they cannot lift under pressure of the cut, and have ample bearing surfaces.

All rotating members of the machine are mounted upon well lubricated ball bearings, and a force-feed oiling system supplies ample lubrication to all moving parts. The upper part of the column is so designed as to carry away the chips from the cutter and is easily accessible for cleaning. The construction of the bearings and slides is such that chips or sediment cannot work in from the outside.

Because of the fact that the work lies in the carriage right side up and with the cutter entering from below, the operator's vision is unobstructed and the lay-out is at all times under his observance. The machine occupies a floor space of 49 by 58 in. and weighs approximately 2,000 pounds. It is driven directly from the line shaft by a $2\frac{1}{2}$-in. belt without a countershaft.

Landau Multiple-Spindle Drilling and Tapping Heads

The Models E and F back-geared tapping chucks recently placed on the market by the Landau Machine and Drill Press Co., 45 West 18th St., New York, N. Y., were described on page 906 of *American Machinist*. A multiple-spindle head operating on the same principle and designated as the Model H is shown at the right of the accompanying illustration. The head is equipped with five tapping spindles equally spaced on the circumference of a circle. The distance from the center of the driving spindle to the centers of the tapping spindles is $2\frac{1}{2}$ in. on the head shown.



LANDAU MODEL K DRILLING HEAD (AT LEFT), MODEL H TAPPING HEAD (AT RIGHT)

The main driving spindle is mounted on ball bearings. The speed of reversal is four times as fast as that of the forward speed. The device employs standard chucks to hold the tap, and the capacity is up to $\frac{1}{4}$ in. Clutches disengage when too great a strain is placed on the taps. The taps can be fed right down to the bottom of the hole, and they stop automatically without danger of breaking when an obstruction is encountered. The outside of the housing is smooth and there are no projecting screws on it.

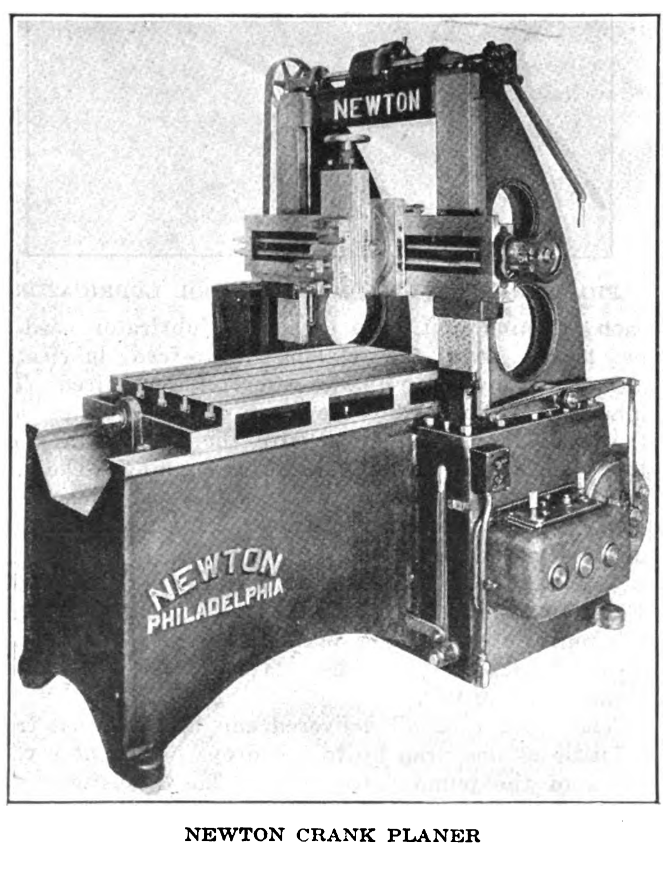
At the left of the illustration can be seen the Model K multiple-spindle head used for drilling the holes before the Model H head is employed. The head is similar in construction to the Model H, although it is not, of course, fitted with a reversing mechanism. The main drive has ball bearings, and the drilling spindles also are equipped with ball bearings and have standard taper shanks for carrying the drills. The two heads can be used in conjunction with each other to drill and tap a number of holes simultaneously and to give a high rate of production on such work.

Newton Crank Planer

In order to provide a heavy-duty tool for short-stroke work, the Newton Machine Tool Works, Inc., 23rd and Vine Sts., Philadelphia, Pa., has just placed on the market the crank planer shown in the accompanying illustration. The machine is made with either one or two heads on the crossrail, as may be required, and has a capacity of 32 in. in width and 32 in. in height, with a maximum stroke of 34 in. The base is a one-piece, box-type casting. The uprights are of box section, bolted and doweled to the base.

The motor is mounted on the off side of the planer and speed variation is controlled by the gear box shown in the illustration. The hardened steel gears in this box are of the sliding type and fully enclosed to run in oil. All driving bearings are bronze bushed. The main driving gear is of the helical type and has a $4\frac{1}{2}$-in. face and is 37 in. in diameter. It drives the rocker arm and gives a relatively uniform cutting speed with the advantage of a slightly lower speed at the start of the cut. The quick return has a speed ratio to the forward speed of $1\frac{3}{4}$ to 1. The length of the stroke can be set from the operating side, an indicator being provided to show the length. Provision has been made for speeds of 6 to $35\frac{1}{2}$ strokes per minute. Cuts $\frac{3}{8}$ in. deep with from $\frac{1}{16}$ to $\frac{1}{8}$ in. feed may be taken on forged steel.

The table is of double-plate construction. It is provided with an adjustment of 20 in. along the bed, which adjustment can be made while the machine is stroking. After the table has been positioned, the driving element can be clamped in position by the square-end shaft shown at the end of the table. Control of the table motion is through a clutch



NEWTON CRANK PLANER

and a brake operated by the lever at the operating point. Provision is made for locking this lever out of position, so that the machine cannot start and possibly injure the operator.

The feed motion is of the double-cycle type, operating on the return stroke of the table. It is transmitted to the crossrail through a rack and pinion, giving cross, down and angular feeds. The crossrail is raised and lowered by power derived from the belt shown in the illustration. The planer is especially suitable for machining die blocks, forming dies, locomotive crossheads, shoes, wedges, or other short-stroke work.

Madison-Kipp Automatic Force-Feed Machine Tool Lubricator

An automatic force-feed machine-tool lubricator that has recently been developed by the Madison-Kipp Corporation, of Madison, Wis., is illustrated in Fig. 1. The lubricator is in principle similar to those formerly made by the concern. A grooved plunger is operated from a double eccentric, so that it rotates on its upward and downward strokes and causes a registration of the inlet and outlet ports with the grooves in the plunger. No ball and spring valves are employed. The lubricator can be made for lubricating any number of positions, and can be installed on large automatic machines or simple bench grinders and single-spindle drilling machines.

Either four or eight positions can be lubricated from each pumping unit. An eight-feed lubricator need be no larger than the standard two-feed lubricator, although it may have a large reservoir if required. The lubricator is driven by the machine it lubricates, and therefore starts and stops with the machine and delivers oil only while the machine is running. The time of the operator is saved, as it is necessary merely to replenish the oil in the reservoir, instead of oiling all oil holes on the machine.

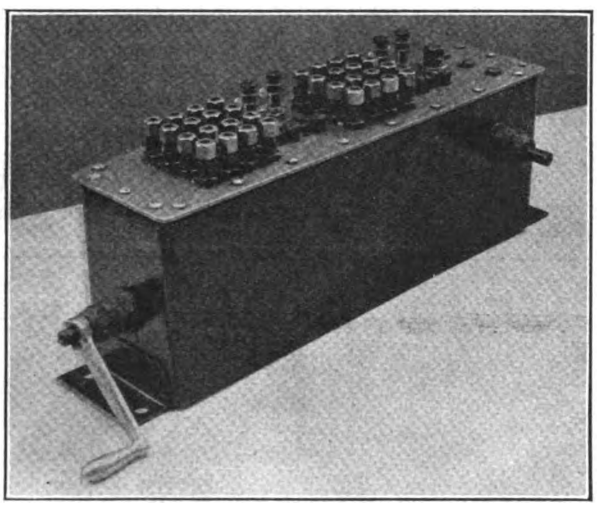


FIG. 1—MADISON-KIPP MACHINE-TOOL LUBRICATOR

The lubricator consists of a reservoir and cover. Fixed to the cover and working in the oil are the pumping units for measuring and forcing the oil to the feed outlets and bearings. There is no pressure tank with choke-valve outlets.

The amount of oil delivered can be regulated from as little as one drop up to ten drops per eight revolutions of the pump drive shaft. The adjustment for each set of eight feeds is made by means of one slotted-head screw shown on top of the lubricator. The other slotted-head screws mounted on the test connectors are employed when it is desired to observe the amount of oil being delivered by each unit. Changing the speed of the lubricator drive shaft makes possible a further regulation of the amount of oil delivered.

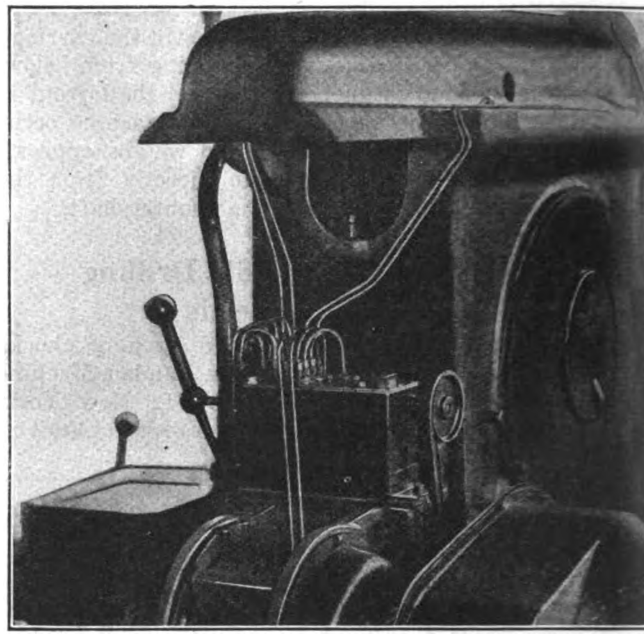


FIG. 2—LUBRICATOR ATTACHED TO SHAPER

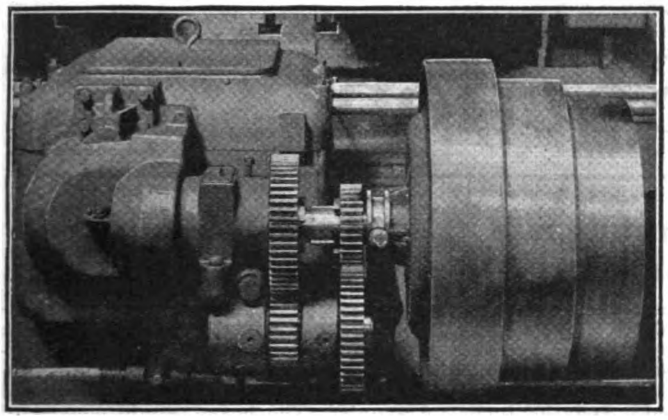
The 32-feed lubricator illustrated is arranged for belt drive with the driving shaft located on the side of the reservoir. The drive of the lubricator may be of the ratchet type requiring a reciprocating motion, or it may be arranged for pulley drive from a rotating shaft of the machine. The device can deliver oil against high pressure.

Each reservoir is provided with an oil-level indicator and a large filler cap and strainer. The lubricator illustrated with a pipe plug instead of filler cap is for use in a large system where oil is filtered and re-used. The drive shaft may be placed on either the side, end or top of the lubricator. Since the pumping, measuring, and driving mechanisms are all attached to the cover of the lubricator, the reservoir can be made a part of the casting of a machine, so that the lubricator becomes an integral part of the machine. When desirable the lubricator may be had with two compartments, allowing the use of two different grades of oil.

In Fig. 2 is illustrated a 16-feed lubricator attached to a 26-in. motor-driven shaper. The lubricator is belt driven from the clutch shaft. All points originally provided with oil hole covers are connected to the lubricator, and each way of the ram is provided with two oil leads. The oil consumption is stated to be one pint to fifty hours of machine operating time.

Slow-Speed Drive for Cincinnati Boring Mill

The Cincinnati Planer Co., Cincinnati, Ohio, has recently developed a mechanism for its boring mill to provide slow speed, as well as the ordinary range of speed of the table. This mechanism is shown incorporated in the drive in the accompanying illustration. The machine on which the device is here fitted is a 7-ft. boring mill that is arranged for speeds about 30 per cent in excess of the standard speeds, so that it can work effectively on locomotive driving boxes and



SLOW-SPEED DRIVE ON CINCINNATI BORING MILL

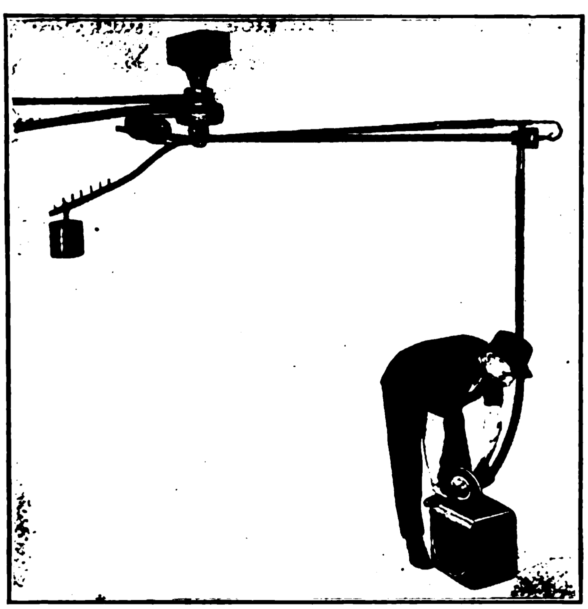
other brass parts. The addition of the slow-speed device enables the turning of tires on the same machine, a speed as slow as $\frac{2}{3}$ r.p.m. being obtainable.

In the position shown the reducing gears are operating, and the table would move at low speed. By sliding the small upper gear into the clutch of the larger gear, direct drive can be obtained so as to utilize the regular speeds of the boring mill.

A special cover serves to protect all of the gearing, and also the shifter rod for sliding the gear into engagement. The arrangement makes the machine capable of both very high and very low speed, and the device does not interfere with the operation in either range.

Stow Radial Flexible Shaft Outfit

A mechanism for driving a large flexible shaft from a lineshaft without the use of an individual motor is ilustrated herewith. The device has recently been developed by the Stow Manufacturing Co., Inc., of Binghamton, N. Y. The chief feature is the pivoted horizontal arm, which enables the operator to work



STOW RADIAL FLEXIBLE SHAFT OUTFIT

over a large area. The arrangement of the counterweight for the arm, and of the driving belt, can be easily seen.

The radial flexible shaft outfit is adapted particularly to use in garages, repair shops and vulcanizing plants. Besides being used for grinding and buffing, it can be employed for drilling, or operating a screwdriver. The mechanism can be supplied in various sizes to suit different classes of work.

B. & S. "Rex" Micrometer

The "Rex" micrometer has just been brought out by the Brown & Sharpe Manufacturing Co., Providence, R. I. to afford a high-grade precision tool at a low price. This line of micrometers is furnished for either English or metric measure and includes twenty-four sizes of micrometers to take measurements up to 24 in.,

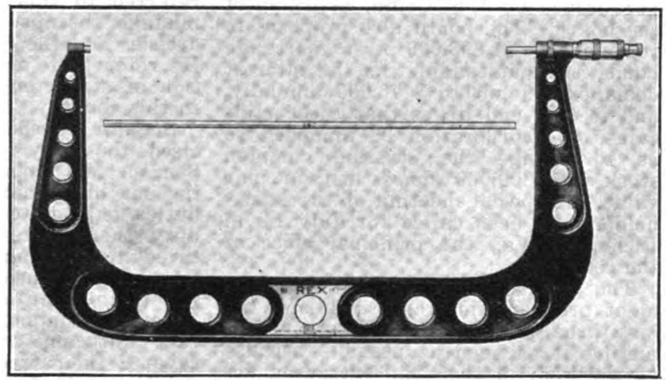


FIG. 1. B. & S. "REX" LARGE MICROMETER

or 600 mm. The micrometer is regularly provided with a clamping ring to clamp the spindle and preserve the setting.

A feature is the rectangular shape of the frame, a construction that gives greater measuring capacity than

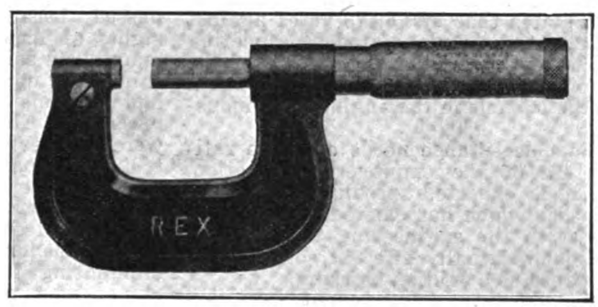


FIG. 2. REX 1-IN. MICROMETER

frames of the circular type. Hole are used in the larger sizes to lighten the frames, as can be seen in Fig. 1. The anvil, spindle and other parts of the tool are similar to the parts of the regular Brown & Sharpe micrometer and means are provided for adjustment for wear of the measuring surfaces and screw.

In Fig. 2 is shown the No. 11, 1-in. micrometer without a clamping ring or ratchet stop. It is the smallest and simplest tool for the line, and hence the most reasonably priced. The frame is of I-section. In larger sizes the bends in the frame are reinforced, so as to increase the rigidity. There are holes in the web on the largest frames.

It is claimed that, while the price of these micrometers is low, their accuracy is held to the Brown & Sharpe standard. In the larger sizes, the micrometers can be provided with finished wooden cases. The tools can be furnished singly or in sets.

News Section

Locomotive Works Plans Great Expansion

Completion of a program of enlargements and additions to cost approximately $1,500,000, to give an increased capacity of 50 per cent, is being pushed by the Lima Locomotive Works, Inc., according to a recent report issued by J. S. Coffin, chairman of the board. The board also proposes to redeem the $1,393,000 first mortgage bonds now outstanding, as the interest demands amount to $170,000 annually, and to this end urges that the certificates of incorporation be amended so as to change the existing common stock into 309,000 shares without par value. A special meeting of the stockholders has been called for July 14, in Richmond, Va., the principal office of the company.

The company has had its enlargement program in progress during the last three years and is desirous of completing it as soon as possible because of the opinion that "an increased demand for locomotives is to be expected next year, and perhaps for several years, in view of the known needs of the railroads of the country."

British Engineering Lockout Ended by Vote

A recent cable dispatch from London states that by 76,478 votes against 39,423, the Amalgamated Engineering Union has voted for acceptance of the employers' proposals for the settlement of the lockout in the engineering industry.

This acceptance needs only the ratification of the employers' federation, which is expected speedily, to end the impasse which has existed for fourteen weeks in the engineering trades. The lockout originally affected some three-quarters of a million workers.

An official announcement says arrangements have been made for resumption of work immediately and employment will be given to members of the union as quickly as factory arrangements allow.

American Machines Exhibited at Brussels Fair

Among the machine tools exhibited at the recent Brussels Fair were the following American makes: Pratt & Whitney Co., Hartford, Conn.; R. K. LeBlond Machine Tool Co., Cincinnati, Ohio; Dauber-Kratsch Co., Oshkosh, Wis.; Chas. G. Allen Co., Barre, Mass.; Norton Co., Worcester, Mass.; Heald Machine Co., Worcester, Mass.; Stockbridge Machine Co., Worcester, Mass. These tools were shown under belt by Henri Benedictus, a Brussels dealer, who reports considerable interest and satisfactory results.

He also exhibited Norton abrasive wheels, Pratt & Whitney small tools and Disston files.

Finance Committee Still Debates Tariff Rates

Yielding to objections voiced by Senator Jones of New Mexico, the Senate Finance Committee has acceded to a demand to reduce the duty on steam engines and steam locomotives from 20 to 15 per cent. Senator Jones referred to this duty as a "colossal" mistake, because of the size of the articles and the extent of the industry. He referred to the stupendous production of steam engines and locomotives in this country.

Senator Jones and others also criticised the duty on sewing machines. Senator McCumber admitted that sewing machines did not need protective duties, but pointed out that without the duty the articles could be manufactured abroad and shipped and sold in this country cheaper than the cost of American manufacture.

Senator Simmons opposed the 25 per cent duty on sewing machines, and favored their free importation. Senator Underwood also opposed the duty, declaring that the Singer Sewing Machine Co. and the National Cash Register Co., are trusts controlling the markets here and abroad.

Senator Stanley referred to the failure of Congress to pass his bill to amend the patent laws to protect American patent rights growing out of resumption of the patent treaty with Germany. He said the bill was not passed because it would endanger rights of American patentees in Germany. He said the Singer Sewing Machine had opposed the bill because it had millions of capital in American patents in Germany and if the treaty were not revived Germany would control these patents. He charged that Germans are making sewing machines under American patents by American capital and enterprise in Germany.

An amendment by Senator Jones eliminating the duty on sewing machines was rejected, 23 to 31. Another amendment by the Senator confining the 40 per cent duty to sewing machines valued at more than $75 was rejected, 24 to 31.

An amendment by Senator Walsh to eliminate the duty of 25 per cent on cash registers was debated but action deferred.

Senator Stanley said that with the exception of steam engines, and various electrical devices, nothing had contributed more to making this country the industrial master of the world than the perfection of the open-hearth furnace. This furnace had permitted the use of all ores. He opposed the duty on fire brick on the ground that it would add to the cost of steel production.

The duty of 25 per cent ad valorem on automobiles, automobile bodies, chassis, motorcycles and parts, not including tires, as recommended by the committee, was adopted in the debate. The matter of countervailing duties to meet higher duties imposed on American automobiles was passed over for later consideration.

Adjustment Board for Navy Yard Wages

Representative Hull, of Iowa, has introduced a bill in Congress to create a board of adjustment which shall constitute a wage board and board of appeals for employees of Navy Yards and Arsenals. The board would consist of twelve members, three appointed by the Secretary of War, three by the Secretary of Navy, and six to be chosen by the civilian employees. It would establish wages annually on the first day of January based on maintenance of a standard of living, the relation between wages and cost of living, training and skill, responsibility, and the average change in per capita productivity of manufacturing industries over the preceding ten years.

Germany's Auto Exports Decrease 40 Per Cent

The February exports of automotive products from Germany, totaling 684 passenger cars, motor trucks, and chassis, decreased nearly 40 per cent, as compared with exports during January, according to unofficial reports received by the automotive division of the Department of Commerce. The total exports of cars and chassis for the first two months of 1922 amounted to 1,775. Of the February shipments, the Netherlands took 30 per cent, Belgium 14 per cent, Spain 8 per cent, Switzerland 4 per cent, Denmark 4 per cent, Sweden 4 per cent, France 2 per cent, Great Britain 2 per cent, and Austria 2 per cent.

Fabricated Steel Sales Fall in May

Sales of fabricated structural steel during May amounted to 82 per cent of fabricating capacity, according to reports made to the Department of Commerce by firms comprising 70 per cent of the fabricating capacity of the United States. The May business reported by eighty-two firms, having a capacity of 130,600 tons, totaled 106,620 tons, as against April sales of these same firms amounting to 121,211 tons, or 93 per cent of capacity.

Total sales throughout the United States, based on the reported percentage and a total capacity of 180,000 tons, amounted to 146,900 tons in May, while revised figures for April give a total of 165,900 tons. The April figures are based on reports from eighty-seven firms, having a total capacity of 132,600 tons, whose sales amounted to 122,198 tons, or at the rate of 92 per cent of capacity.

War Surplus Sales

The War Department reports that up to May 15 a total of $228,397,352 of surplus supplies of the Ordnance Department were sold or transferred to other Government departments, which was 33 per cent of the original cost.

Business Conditions in Germany

BY OUR BERLIN CORRESPONDENT

The situation of the German industry presents no apparent difference to that of last month. Production continues with undiminished intensity, and the amount of orders in hand is sufficient to save most manufacturers from worry almost over the rest of the year. The unhealthy inside conditions are, however, becoming more and more pronounced. Moreover, a material change in the state of the market, the beginning of which could be noticed some time ago, is steadily gaining in dimensions. Although the demand along the chain of consumers shows no slackening in its middle stages, it has weakened considerably at the ends. The buying craze of the ultimate consumers has subsided, and the relations between them and sellers have become rather strained. People, inspired by the optimism of the daily press with regard to the great political problems pending, are of the opinion that the upward rush of prices has reached its climax and that even a reverse may be expected. Such expectations are chiefly based upon hopes for a large international loan to Germany, with a decided improvement of the mark to follow. Kindred hopes were entertained with regard to the Genoa Conference.

Prices Out of Reach

Of the expected break in the movement of prices nothing can be seen yet. The rise in prices of the basic products has not had time to take effect upon finished products. The finished article has, of course, to bear the price increments which its component parts accumulate during the course of production, and for this reason it seems rather idle to speculate on a stoppage. The fact remains that present prices have surpassed the purchasing power of the great mass of consumers, which alone is sufficient to cause a strong reaction upon the market. Coal, for instance, has reached a price level which makes it almost impossible for the salaried population to pay for the house fuel. Relations between the income of the population and prices are already seriously disturbed. Balance can only be restored by raising the income, which remedy would be of a transitory character only, as it would add new impetus to the movement of prices. Wholesale prices have now, according to index figures, arrived at 50 times the pre-war level, whereas the income has only increased by about 30 times in the case of manual laborers, and 20 times in that of clerical workers. Living costs have risen from 20 to 30 times above prewar level, which appears to conform to the level of wages, whereby it has to be considered that these figures are drawn up in a rather doubtful way, evidently founded upon a much lower standard of living than in pre-war times. The other alternative for restoring the economic balance is a further drop of the exchange rate, which is at present kept in check by some unseen forces, helped by the hopes already mentioned.

These hopes, although pronounced in the upper classes, are insufficient to keep in check the discontent of the working population. The strike fever is growing perceptibly. It would probably have accumulated greater force if wages in all groups of workmen were on the same level. The disparity prevailing prevents concerted action, thereby depriving the latent conflict of its kneenness.

While in North Germany the 48-hour week is in force universally, the working time in South Germany is restricted to 46 hours per week. The South German manufacturers, being somewhat handicapped by this disparity, have tried to persuade the workmen to conform with conditions in North Germany. This is strictly within the demobilizing ordinances limiting the working time to 8 hours per day. Still the workmen are opposing any increase of their working time as a matter of principle, on the ground that it would prejudice their position and declaring that one concession on their side would lead to further attempts on the side of the employers. In this contention they are not quite sincere, as they are open to agree if wages are increased. The extent of the increase demanded, 100 per cent, puts such a solution of the difficulty out of the question, and makes it clear that the workmen have no wish to accommodate the manufacturers. A compromise by the latter of 47 hours a week was refused.

The arbitration courts, which took the matter in hand after direct negotiations between employers and workmen arrived at a deadlock, decided in favor of the 48-hour week. Their finding was, however, not accepted by the workmen, whereupon they went on strike in most cases, followed by lockouts in others. All persuasion used upon the workmen, appealing to their commonsense and public spirit, was wasted. The large metal industry of South Germany laid idle for many weeks. The whole South German machine building and motor car industry which is manufacturing for export to a large degree, and therefore is a factor of national importance, was affected. The loss resulting therefrom to the country as a whole was very large.

Labor Will Not Concede

Much more alarming than this direct loss is the aspect the strike opens upon the labor problem. If the workmen are not amenable to reason in a trifling case like this, it is clear what attitude they would take if they were required to make serious concessions in the direction of the old order of things. They are making it quite evident that they are determined not to retreat a single step from the strongholds of their present position no matter how the country fares. The South German strike which ended in a retreat of the manufacturers, barely veiled behind a very lame compromise, may well be considered as a test piece of the great labor battle which is ever looming up darkly on the horizon. The gulf between the workmen and manufacturers is indeed not over the question of wages but over the conflict between socialism and the exigencies of production. The two are at present strongly opposed, with no hope in view of reconcilement. At no other time since the revolution is the necessity of higher efficiency and increased production more clearly put in relief than at the present time, which shows how far the productive capacity of Germany is reduced. Expansion can only come from an increase of manual labor and a higher efficiency of mechanical labor. The great dilemma of the country is that the one is withheld on the ground of socialistic theories, and the other cannot be supplied for lack of means.

In the latter respect the present time also is an eye-opener. In the business reports coming in from all parts of the country the most prominent feature has lately become the lack of working capital. The changed attitude of the money market towards the calls of industry has become strongly marked. New capital issues which only a few months ago were readily absorbed are falling flat, and the investors show disinclination to take up any more stock, even at or near par value.

Capital Tied Up

The population has for some time been groping in the dark for a solution of this unexpected development which is strongly reflected by the attitude of the stock exchange, even toward the most favorable stock. The explanation is now outlining itself more clearly. In the course of the present boom, with the enormous rise in prices accompanying it, an ever increasing part of the national capital has become tied up in manufacturing deals. It was estimated some time last year that the capital actually "working" in industry, and therefore out of circulation, is 50 billion paper marks. When considering that prices since then have more than doubled, and at the same time the speed of turnover has become delayed in almost the same proportions by the clogging of the economic machinery, it is clear what a large increase of tied up capital has taken place, which probably has assumed a size forming the larger part of the whole floating debt of the country. It is rumored that potential forces are at work to stem the inflation of German currency, but inflation is still going on.

The German industry has now commenced to realize how poor it has become in spite of appearances. In foreign countries this is not realized yet, rumors of enterprises like those of Stinnes still upholding the belief of untold riches. It is an open secret that many business men, who kept funds in foreign countries, have had to withdraw them. In place of a flight of capital out of the country, the reverse is now taking place. If German industry were called upon today to supply the billion gold marks proudly offered only six months ago as a loan to the government, it could truthfully point to empty pockets.

As an illustration to what extent even the largest firms have had to make concessions in order to obtain fresh capital may be mentioned the case of the leading incandescent lamp manufacturer, the Osram Company, a combine of the foremost electrical firms in Germany. This firm recently floated an issue of a new type of bond which, besides the

fixed interest, carries a dividend to a certain limit.

The natural result of such conditions is that the industry is running dangerously short of raw materials, especially of the more expensive kinds. Even the supply of iron is entirely insufficient at the present rate of consumption. The high-handed action of one of the largest German dealers in iron and steel products, who canceled all orders placed at lower than present prices, is an illustration of this fact, especially as it is known that the dealer is the selling agent of several of the leading German steel works, and closely linked with them financially. Such offences against good faith are entirely unsupported by law, and have indeed been condemned often in courts and by public opinion.

With regard to the situation in the iron, steel and machinery building industries, the following can be said: Complaints from all sides with regard to insufficient coal supply have become more and more virulent. The steel works are handicapped by the scarcity of the grades required, and the foundries are complaining of lack of foundry coke. The situation is greatly strained, but the difficulty is chiefly caused by the dwindled reserves of pig iron and scrap. In spite of the lately improved output of coal and coke, the blast furnaces are unable to produce the increased quantity of pig iron required. The consequence is that considerable quantities have to be imported. Manufacturers declare that these imports necessarily tend to increase the cost, which is a strong exaggeration of facts.

From the small tool industry it is reported that although new orders are still freely given, the business boom seems to have passed its climax. The prices of files, saws, drills and other tools have in many cases already reached the world market level, and for this reason the export business has slackened perceptibly.

A Decline Expected

Employment in the machine building industry continues to be satisfactory, but a decline of business is soon expected. In certain parts of the country, chiefly Rhineland, an actual decline had already set in by the end of April, which is evidenced by considerable shortening of delivery times. Cost of production is still increasing in an alarming degree with no stoppage in sight. The recent increase of prices of castings is nearly one-third, and further rises are expected.

Locomotive and railroad car works have now received state orders which, although only half of last year's size, are sufficient to keep them well employed for the rest of the year. The Railroad Administration has in this case, for the first time in its history, had to concede sliding prices. The foreign business of this industry is visibly declining. The times when it could draw profits with full hands out of the disparity between the value of the mark abroad and in Germany are past. In several cases tenders have lately been underbid by foreign competitors, chiefly English and Belgian.

Business in the machine tool industry is brisk, although a considerable break in the upward curve of employment can be noticed. The machine tool trade, which is as a rule in a better position to feel the pulse of the market, is exercising again considerable caution with regard to placing new orders. The leading works, which in the majority sell to consumers direct, notice little difference, but manufacturers selling chiefly to the trade complain of a perceptible slackening of business. Standard tools, which for a time have enjoyed a demand no less brisk than that for single purpose machines, are again losing ground steadily. A change in the demand for specialized tools is not noticeable yet, but it is felt that the attitude of the buyers has changed in this respect also. The buyers, who quite recently have hardly looked upon prices—quick delivery being the first consideration, are now commencing to haggle, exhibiting strong objection to sliding prices. Inquiries are still received in even increased numbers but the percentage of orders realized therefrom is diminishing.

Prices of tools are still rising. The Association of German Machine Tool Builders gives for each month directions for the fixation of prices, which may be seen from the following figures indicating the percentage of increases over the November prices for each consecutive month:

December	34	per cent
January	40	per cent
February	54	per cent
March	70½	per cent
April	100½	per cent
May	120	per cent

The prices in force in November were from 15 to 30 times pre-war level, according to size and quality. At present the actual sale prices vary from 35 to 70 times the pre-war prices. The margin between export and domestic prices has almost disappeared, and a number of tools have at the present rate of exchange already reached pre-war level. There is not the least likelihood of a stoppage. Information received coincides in the belief that further increases of at least 20 per cent will be required during the coming months, as the recent increase in the prices of coal, material, freight and wages, which cannot yet be gaged in all its consequences, is not being taken care of by the present sale prices. If the exchange rate were arrested even at the present stage, times for imports would not seem to be far away, and a number of dealers are already figuring on American machinery.

The upward movement of prices can of course not fail to exercise a strong influence on the export business of the machine building industry. Cancellations of foreign orders are already received in alarming numbers. It appears that many foreign buyers are trying to scramble out of contracts wherever they offer a loophole. The decrease of the machine tool exports from 7,336 tons in February to 6,852 tons in March is in all probability already an indication of changed conditions. It is peculiar to note that while the returns in paper marks for the March exports show an increase of six million over those of February in spite of their diminished quantity, their equivalent in gold marks at the average exchange rate of March constitutes a further drop, the prices only averaging 400 gold marks to the ton, or 40 per cent of the pre-war average. The exports of the chief lines of the machine building industry during the first three months of the year are given here:

	— Metric Tons —		Value in Million Marks		Ratio to Pre-war Standard
	1922	1913	1922	1913	
Railroad engines	19,002	10,932	731	11	38
Power engines (stationary and portable)	11,094	15,545	333	16	29
Textile machinery	9,298	18,793	502	27	37.5
Machine tools	21,085	17,852	537	21	22
Agricultural machinery	8,242	8,340	150	7	19.2

As can be seen, the machine tool exports are considerably higher than in 1913. This may in some measure be due to different calculation, wood working machinery evidently being included in machine tools.

The total of the machinery exports from January to March in 1922 was 112,190 metric tons, which compares favorably with that of the same period of 1913, the latter being 129,624 tons.

While the boom is apparently still in full swing, the leaders of industry have lately commenced to foreshadow serious times ahead. A gloomy view to this effect formed the keynote of a speech recently made by Stinnes, supported by the speakers at the annual meeting of the National Association of German Industry, and that of the Machine Building Industry. On what ground that view was based was pronounced in no case, leaving it open for each individual to speculate upon. Sinister events are darkly hinted at, adding to the spirit of uncertainty already prevailing. Whatever they are, one thing is clear, that prices have broken all bounds, and that the carefully preserved control of prices is failing for the first time since the revolution. The upward rush of prices has carried business already to the threshhold of the alternative, either of a speedy collapse or a further downslide of the mark. If the latter is stemmed, which the country is led to believe is possible, a reverse will set in, leading straightway to great labor disputes.

In leading quarters there is hardly any illusion left with regard to the seriousness of the present situation, and it can be said that the hopes at first based upon Russia as a probable saviour of the situation have by sober reflection diminished into insignificance. Considering the stringency of money already dwelt upon, there is no chance of Russian business developing to a degree which could offer any compensation for losses in other markets. Efforts are made to further this business, and an exhibition of German products—chiefly machinery—in Russia may be mentioned in this connection. The question of financing, over which so much hopeful looking business has already broken down, is a drawback to all such endeavors. German agents are traveling all over Russia in the hope of picking up business or concessions, but the attitude of the business world as a whole towards Russia is very skeptical, to say the least, and unless Russia finds an outlet herself out of her difficulties, it cannot be seen how the two countries could profit mutually from the economic relations they have now entered into.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

The New York Stock market had a fainting spell last week. The other speculative markets broke slightly in sympathy. Cotton, grain, hog products, sugar and coffee all declined more or less but the losses were partially or entirely recovered when it came to be understood that there was nothing seriously wrong with the security markets and that the slight derangement there was probably due to a mild attack of indigestion induced by over eating. But when a reaction is overdue it only needs a trifle, real or imagined, to precipitate it, and now that the nausea and vomiting are over with, a recovery of strength and confidence is definitely indicated.

This statement is based not only upon a careful investigation of the record but upon what I saw and heard as I visited some of the more important cities of the Middle-west last week. Almost everywhere the demand from the agricultural regions is excellent. The sales of the mail order houses are increasing rapidly and the jobbers report an excellent trade. Bank clearings are increasing almost everywhere and constant buying is necessary to replenish the depleted stocks. Dry goods, shoes and staple goods of nearly every description are readily salable and there is a distinct and significant improvement in the inquiry for farm implements and machinery.

A shortage of labor, especially farm hands, is generally reported. Some employers attribute it to the law restricting emigration, but it is fundamentally due to the abundant credit which has made it possible to float the large bond issues whose proceeds are now being spent in improvements that employ thousands of men. In Cleveland, for instance, work has just been started upon the long promised railway station. It will cost $58,000,000, most of which will be paid out in wages. The railways are planning much other work that will cost millions, and hundreds of millions will be spent in roads and municipal improvements, the money for which has been provided through bond sales.

These disbursements are at the bottom of the country-wide prosperity that is obvious, and while it may be slightly affected if wheat does not recover some of the recent decline, I was surprised to hear some large farmers admit that with a good crop they could make money on "dollar wheat."

Prices for iron and steel are tending upward. Zinc and lead are also higher, but the demand for copper is still freely suplied at between 13¾ and 14 cents. Optimism and activity are still reported in the motor industry.

The slight decline in sugar that occurred while the stock market was breaking has been entirely recovered and the indications still favor much higher prices.

Silk is steady. Wool and woolen goods are firmer and the cotton trade was supplied with a very bullish argument in the consumption report for May, which shows that the American mills took 495,674 bales in that month and that the total of consumption and exports for the year ending July 31 will probably exceed 12,000,000 bales.

Rubber is firmer upon a cable from Java saying that the Dutch growers will probably agree to limit the output, and a further advance in both hard and softwood lumber is another significant straw in the current of prices.

The New England textile strike is practically ended as the operatives are rapidly returning to work.

Our foreign trade figures for May show exports valued at $308,000,000 and imports worth $254,000,000. As compared with last year there is a decrease of $21,000,000 in exports and an increase of $50,000,000 in imports, which have probably been accelerated by the pending tariff bill. The figures are not especially significant otherwise.

The money market continues easy. The New York banks have reduced the rates paid on balances and bankers acceptances have sold as low as 2¾ per cent, while the going rate on commercial paper is 4 per cent. The weekly statement of the Federal Reserve System shows no important changes. The Bank of England has reduced its rate to 3½ per cent and call money in London is lending at from 1 to 2 per cent.

Lloyd George and J. P. Morgan have had a conference about the abandoned German loan, and unless the former has lost his persuasiveness and the latter his influence the issue of a loan that will work the financial rehabilitation of Europe is a question of only a few months. The first meeting of the Hague conference was held last Thursday. Nothing being expected of it, something may be accomplished.

The market for sterling and francs has recovered the decline which followed the adjournment of the bankers' conference, and even marks are slightly higher despite a report which puts the outstanding circulation on June 7 at 154,914,880,000 marks.

Other foreign developments are generally encouraging. France has averted the complete bankruptcy of Austria by lending that distressed government 55,000,000 francs. Lenin is either dead or paralyzed and with his passing the peaceful penetration of Russia by Western civilization is brought nearer.

The lockout in the British engineering trades has been settled and 600,000 men have returned to work on the employers' terms. An East India bond issue for £12,500,000 has been successfully underwritten in London, and Jugo-Slavia has negotiated a loan of $25,000,000 in New York. The bonds run for forty years and go to the public on a basis which yields 8.4 per cent. Trade throughout the British Empire seems to be on the mend and a boom is reported from far off Australia.

Mexico appears to have agreed upon a settlement with her creditors as represented by the bankers in conference with her finance minister, Señor de la Huerta, in New York, and Mexican securities have advanced sharply. Cuban finances are being rapidly straightened out under the wise direction of General Crowder and travelers recently arriving from Spain tell of a great industrial transformation in that romantic country. To top all this 10,000 travelers left New York for Europe on the steamers sailing June 10, and it is now estimated that our tourists will spend at least $500,000,000 on the other side the Atlantic during the present summer.

Coal Strike Dangerous

The only shadows which darken this bright outlook are the unsettled coal strike, the assininity of Congress in attempting with procrastination to foster an absurd tariff bill on the country and the predicted return of the 17 year locusts due this summer. These things are mentioned in the order of their importance. With the assistance of the newspapers the menace of the tariff bill and the locust will probably disappear but the coal strike may result in real trouble next winter unless it is soon ended. A cargo of Welsh coal is on its way from Cardiff to New Bedford, but we cannot of course rely upon imported coal for our requirements and some way to start up the American mines must speedily be found.

Carborundum Takes Leading Role in Film Production

An eight-reel moving picture of the production and use of carborundum has been produced by the Rothacker Film Manufacturing Co., of Chicago, for the Carborundum Company, of Niagara Falls. The picture has been given the appropriate title of "The Jewels of Industry." The picture shows how carborundum is produced at a temperature of 4,000 deg. F. and visualizes step by step the various processes by which the crude carborundum is converted into grinding wheels and other forms of abrasives to meet the needs of industry.

The picture is more than a story of carborundum; it is virtually a survey of American industry. In producing the picture the film company sent cameramen to fifty-eight different industries to obtain scenes picturing carborundum on the job in its various uses. The picture in its entirety is eight reels but it has been broken up into units to fit various lengths of programs, and to present features that would prove most interesting to different audiences. Copies will be placed at the disposal of the Government for use in the campaign started by Secretary of Commerce Hoover to use movies to create foreign markets for American products.

American Railway Association Conventions at Atlantic City

With everything their own way on the Million Dollar Pier, and with apparently few counter attractions, the Mechanical Division and the Purchases and Stores Division of the American Railway Association held successful conventions at Atlantic City, June 14 to 21. The attendance was large and representative of a majority of the membership. More than four hundred members of the Railway Supply Manufacturers' Association had exhibits, approximately eighty of them being exhibits of machine tools and small tools.

The following is a list of the exhibitors of machine tools, small tools and machine shop appliances:

Air Reduction Sales Co., New York City.
Ajax Manufacturing Co., Cleveland, Ohio.
American Tool Works Co., Cincinnati, Ohio.
E. C. Atkins & Co., Indianapolis, Ind.
Beaudry & Co., Inc., Boston, Mass.
Chas. H. Besly & Co., Chicago, Ill.
Baker R. & L. Co., Cleveland, Ohio.
Black & Decker Manufacturing Co., Towson, Baltimore, Md.
S. F. Bowser & Co., Fort Wayne, Ind.
W. L. Brubaker & Bros. Co., New York City.
Carborundum Co., Niagara Falls, N. Y.
Celfor Tool Co., Chicago, Ill.
Chicago Pneumatic Tool Co., New York City.
Clark Tool Works, Belmont, N. Y.
Clark Tructractor Co., Chicago, Ill.
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Cleveland Steel Tool Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland, Ohio.
Cochrane-Bly Co., Rochester, N. Y.
Covington Machine Co., Inc., Covington, Va.
Dale Machinery Co., Inc., New York City, representing
  Betts Machine Co., Rochester, N. Y.
  Colburn Machine Tool Co., Cleveland, Ohio.
  Milholland Machine Tool Co., Indianapolis, Ind.
Davis Boring Tool Co., St. Louis, Mo.
Davis-Bournonville Co., New York City.
Dayton Pneumatic Tool Co., Dayton, Ohio.
Detroit Twist Drill Co., Detroit, Mich.
Diamond Machine Co., Providence, R. I.
Henry Disston & Son, Inc., Phila., Pa.
Horton Chuck Co., Windsor Locks, Conn.
Electric Arc Cutting and Welding Co., Newark, N. J.
Elwell-Parker Electric Co., New York City.
Walter H. Foster Co., New York City, representing
  Ingersoll Milling Machine Co., Rockford, Ill.
  Electric Controller & Manufacturing Co., New York City.
General Electric Co., Schenectady, N. Y.
G. A. Gray Co., Cincinnati, Ohio.
Edwin Harrington, Son & Co., Inc., Phila., Pa.
Hartford Tap and Gauge Co., Hartford, Conn.
Heald Machine Co., Worcester, Mass.
Hendey Machine Co., Torrington, Conn.
Hoggson & Pettis Manufacturing Co., New Haven, Conn.
E. Horton & Son Co., Windsor Locks, Conn.
Hyatt Roller Bearing Co., New York City.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York City.
Wm. H. Keller Inc., Grand Haven, Mich.
King Pneumatic Tool Co., Chicago, Ill.
Landis Machine Co., Waynesboro, Pa.
Lehman Machine Co., St. Louis, Mo.
Lunkenheimer Co., Cincinnati, Ohio.
Mahr Manufacturing Co., Minneapolis, Minn.
Main Belting Co., Phila., Pa.
Manning, Maxwell & Moore Inc., New York City, representing
  Columbia Machine and Tool Co., Hamilton, Ohio.
  Cone Automatic Machine Co., Windsor, Vt.
  National Machinery Co., Tiffin, Ohio.
  Putnam Machine Co., Fitchburg, Mass.
  J. E. Snyder & Son, Worcester, Mass.
  Woodward & Powell, Worcester, Mass.
Metal and Thermit Corporation, New York City.
Midvale Steel and Ordnance Co., Phila., Pa.
The Alexander Milburn Co., Baltimore, Md.
Miller & Crowningshield, Greenfield, Mass.
Morton Manufacturing Co., Muskegon Heights, Mich.
Nazel Engineering and Machine Works, Phila., Pa.
Newton Machine Tool Works, Inc., Phila., Pa.
Niles-Bement-Pond Co., New York City, representing
  R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.
  Pond Machine Tool Co., Plainfield, N. J.
  Stockbridge Shaper Co., Worcester, Mass.
R. D. Nuttall Co., Pittsburgh, Pa.
Oxweld Railroad Service Co., Chicago, Ill.
Peerless Machine Co., Racine, Wis.
Henry Pels & Co., Inc., New York City.
Porter-Richards Machinery Co., Philadelphia, Pa., representing
  Cincinnati Iron and Steel Co., Cincinnati, Ohio.
  Jas. Clark, Jr., Electric Co., Louisville, Ky.
  Willey Electric Tool Co., Jeffersonville, Ind.
Production Machine Co., Greenfield, Mass.
Racine Tool and Machine Co., Racine, Wis.
Reed-Prentice Co., Worcester, Mass.
Joseph T. Ryerson & Son Co., Chicago, Ill., representing
  Black Diamond Saw and Machine Works, Natick, Mass.
  Ryerson-Conradson Machine Co., Chicago, Ill.
S. K. F. Industries, Inc., New York City.
William Sellers & Co., Inc., Philadelphia, Pa.
Simonds Manufacturing Co., Fitchburg, Mass.
Southwark Foundry and Machine Co., Phila., Pa.
Standard Electric Crane and Hoist Co., Phila., Pa.
Swind Machinery Co., Philadelphia, Pa., representing
  Baker Bros., Toledo, Ohio.
  Bradford Machine Tool Co., Cincinnati, Ohio.
  Fosdick Machine Tool Co., Cincinnati, Ohio.
Torchweld Equipment Co., Chicago, Ill.
H. B. Underwood Corporation, Phila., Pa.
U. S. Light and Heat Corporation, Niagara Falls, N. Y.
Universal Boring Machine Co., Hudson, Mass.
Walworth Manufacturing Co., Boston, Mass.
Wayne Tool Manufacturing Co., Waynesboro, Pa.
F. O. Wells Co., Greenfield, Mass.
Williams Tool Corporation, Erie, Pa.
Wright Manufacturing Co., Lisbon, Ohio.
Yale & Towne Manufacturing Co., Stamford, Conn.

Business Items

The American Machine Products Co., Eighteenth and Howard Sts., Detroit, Mich., has been reorganized under the name of the Ampco Twist Drill and Tool Co. The officers of the company are: Earl A. Munger, president: E. A. Wilson, vice-president; Chester P. O'Hara, secretary-treasurer. The company is marketing a complete line of standard tools, including twist drills, reamers, cutters, gages, and similar tools.

The Cole Cylinder Grinding Co., South Bend, Ind., has been organized to manufacture cylinder grinding machinery. The company has a capital stock of $25,000 and is composed of George W. Cole, Fred A. Bryan and Hugh B. McVicker, all of South Bend.

The Kesselkalb Machine Co., Baltimore, Md., has opened a machine shop at 2,578 Hollins St., that city, to do boring and repair work on automobile engines.

The Harley-Davidson Motor Co., of Milwaukee, Wis., has won its case in the Supreme Court. That court directs the Circuit Court of Appeals for the Third District to decide the appeal presented in the suit for infringement of letters patent relating to clutches for motorcycles brought by the Eclipse Machine Co.

The Black & Decker Manufacturing Co., Baltimore, Md., has established a new Detroit office in the General Motors Bldg. C. G. Odell, assistant to president, will be in charge.

Edward Mills, of Midland, Mich., and Samuel Fair, of Saginaw, are organizing a company to operate the plant of the Cooley Castings Co. in Saginaw. New equipment will be installed and it is planned to commence production during July.

The Wilart Instrument Co., New Rochelle, N. Y., has arranged for an increase in capital from $100,000, to $1,000,000, for general expansion.

The Sharon Steel Hoop Co., Sharon, Pa., has called a meeting of stockholders to approve an increase in capital stock from $15,000,000 to $20,000,000, a portion of the proceeds to be used for expansion.

The Powell Iron Works, 270 Sutter Ave., Brooklyn, now operating a local plant, has incorporated with a nominal capital of $10,000, for proposed general increase in operations. The new company is headed by S. Powell and A. Farber.

The Murphy Iron Works, foot of Walker St., Detroit, Mich., has arranged for an increase in capital to $400,000 for increased operations.

The Reo Motor Car Co., Lansing, Mich., has adopted a ten-hour day, five-day week schedule at its plant in the nature of an experiment, and four weeks operation has brought very satisfactory results. A daily production of 130 automobiles is being maintained.

The Blackman Talking Machine Co., Hornell, N. Y., manufacturer of talking machines and parts, has filed notice of increase in capital from $200,000 to $1,000,000 for general expansion.

The Hudson Machinery Corporation, 515 Greenwich St., New York, will operate in the future under the name of Ferguson & Haas, Inc.

The H. O. King Co., 1,145 Diversey St., Chicago, Ill., machinist, has arranged for a change of company name to the King Pneumatic Tool Co.

The Southwest Metals Co., 15 Broad St., New York, has arranged for an increase in capital from $10,000,000 to $12,000,000, for proposed expansion.

The Fleming Machine Co. has been incorporated in Springfield, Mass., to manufacture a set of machines for automotive repair work. Details concerning these machines are to be announced soon. The products will be made in Springfield, the capitalization is $30,000 and the incorporators are George W. Fleming, 38 Virginia St., Springfield, and John G. Perman and F. Julius Quist, of Worcester, Mass.

The Keating Valve Co., Springfield, Mass., has purchased the Robert M. Keating Co., reorganized the business, and has resumed the production of the Keating flush valve. The new concern has Henry L. Bowles as president, and Charles S. Vining as treasurer and manager.

The Lee Rule and Level Co. is being established in Greenfield, Mass., to manufacture a combination tool embracing a rule, level, square and straightedge, under patents it controls. It will occupy the old factory of the Waltham Watch Co. in that town. H. E. Lee, the inventor, is president, F. Anderson is vice-president and

treasurer, and H. H. Hawkins is mechanical engineer.

The American Electric Service and Maintenance Co. has occupied its new building in Springfield, Mass., where it is equipped for rewinding transformers, redesigning motors and other repair work for electric power and manufacturing concerns. Many contracts have been booked, insuring a heavy business throughout the summer.

Avery & Saul, dealers in sheet metals, iron, steel, etc., 207 Congress St., Boston, Mass., has recently incorporated the business under the laws of Massachusetts, and under the name of Avery & Saul Co. The capital stock is $175,000, and the incorporators are: Fred L. Avery and Paul F. Avery, of Winchester, Mass.; Arthur D. Saul, of Arlington, Mass.

Personals

STANLEY H. BULLARD, vice-president of the Bullard Machine Tool Co., Bridgeport, Conn., has been appointed by Governor Lake, of Connecticut, as one of the members of the commission from that state which will study a proposed consolidation of the six New England railroads into one system.

JOHN D. CARMODY has joined the sales force of the Weaver Manufacturing Co., Springfield, Ill. He will have charge of a Middlewestern district.

HARRY M. WEY has been appointed manager of the Chicago district of the Pittsburgh Testing Laboratory with offices at 1,560 Monadnock Bldg.

ROBERT R. JENKS, president of Fales & Jenks Machine Co., manufacturer of cotton machinery, etc., Pawtucket, R. I., has been chosen on the board of managers of the new branch bank in that city, of the Rhode Island Hospital Trust Company, of Providence.

J. MILTON PAYNE, assistant treasurer of the Woonsocket Machine and Press Co., manufacturer of textile machinery, Woonsocket, R. I., has recently been elected chairman of the new board of managers of the new branch in Pawtucket, R. I., of the Rhode Island Hospital Trust Co., of Providence.

HENRY J. MILLER has been elected president of the Lake Torpedo Boat Company, submarine boat builders, Bridgeport, Conn. Mr. Miller comes from Elizabeth, N. J., and is a brother of the late Herbert S. Miller, who was president of the company up until his death a short time ago. Mr. Miller is also a member of the board of directors of the company.

FREDERICK D. HARGER has resigned as vice-president and general manager of the Mono Corporation of America, manufacturers of gas apparatus, with offices in New York City. He has joined the staff of the Chas. J. Tagliabue Manufacturing Co., of Brooklyn, which will take over the manufacture and sale of Mono products.

W. P. CLARK, president of the Clark Tool Works, Inc., Belmont, N. Y., has returned from a five-months' business trip in the Philippine Islands.

CHARLES R. PRICE has resigned the position of superintendent for the Ames Sword Co., Chicopee, Mass., which he had filled for 30 years. He will become general manager of the sword department of the V. H. Blackington Co., Attleboro, Mass.

C. A. SHERMAN, formerly vice-president of the Badger-Packard Machinery Co., of Milwaukee, Wis., has severed his connections with that company. Mr. Sherman has not announced his plans for the future.

C. C. ZIEGLER, St. Louis district manager for the Greenfield Tap and Die Corporation, Greenfield, Mass., has been appointed Western sales manager of that company, with headquarters at Chicago. Mr. Ziegler succeeds Frank Oliver, who resigned to accept the position of Eastern sales manager at New York for the Whitman & Barnes Manufacturing Co., of Akron, Ohio.

P. J. O'CONNOR has left the sales force of the E. L. Essley Machinery Co., of Chicago, and has joined the staff of the Haynes-Stellite Co., also of Chicago.

LINCOLN B. SMITH has been elected treasurer of the Holyoke Foundry Co., Holyoke, Mass.

Obituary

JOHN WARDLE SEEKINGS, secretary and treasurer of the Bridgeport Screw Co., Bridgeport, Conn., died on June 14 at his home in Bridgeport. Mr. Seekings was born in England 56 years ago. He was prominent in manufacturing circles throughout New England and the East.

Trade Catalogs

Sprague Panel Boards. The Sprague Electric Works, New York City. A four-page circular No. 67,900, describing the new narrow-unit panel board, safety type, which is only 10 in. wide outside the barriers. It was designed with a view to conserving space and to market at a reasonable price.

Melting Furnaces. W. S. Rockwell Co., 50 Church St., New York City. Circular No. 243, describing a line of stationary and tilting crucible melting furnaces for aluminum, brass, bronze, copper and other non-ferrous metals. These furnaces are designed to operate with oil or gas fuel. Several types are shown in operation, and detailed drawings are furnished, as well as tables of sizes and specifications.

Filtering Systems. The Wayne Oil Tank and Pump Co., Fort Wayne, Ind. Bulletin No. 6,600, describing the new Wayne Type E circulating oil filtration system. The operation of this filter is thoroughly explained and illustrated by photographs and drawings.

Welding Rods and Electrodes. The Page Steel and Wire Co., Monessen, Pa. Catalog No. 500, a handbook of Page-Armco welding rods and electrodes for oxy-acetylene and electric welding. The book contains a list and description of the various products of this company, including welding materials, steel ingots, wire rods, spring rods and wire strand. Chemical analyses of each type are given, as well as descriptions of heat-treating methods. Among the chapters included in the book are comparison tables on wire gages, conversion tables, decimal equivalents, American Welding Society's specifications, tables of weights and measures, tables of deposited metals, metal composition, metallurgy of iron and steel, oxy-acetylene welding rods, specifications for welding wire, temperatures, tests for welding material, and a wealth of other valuable material for the welding man in the shop.

Drills and Reamers. Gledhill Manufacturing Co., 107 Friendship St., Providence, R. I. A small four-page circular listing a number of types of semi-high speed steel combination center drills, center reamers and counter-sinks. Tables of sizes and price lists are included.

Kingsbury Thrust Bearings. Kingsbury Machine Works, 4320 Tackawanna St., Philadelphia, Pa. A well prepared catalog containing, besides a list and description of Kingsbury thrust bearings, a wealth of material of considerable value to engineers and to users of thrust bearings. Some of the features include dimensions, power loss guarantee, combined vertical thrust and general bearings, Queenston development, propeller thrust bearings, actual power loss determination and standardization of power losses.

Uehling Recording Equipment. The Uehling Instrument Co., Paterson, N. J. Bulletin No. 112, illustrating and describing the CO_2 recording equipment for guiding the engineer and fireman in reducing the waste of fuel up the chimney. Special features included in the bulletin are the "Pyro-Porus" filter for keeping gas sampling lines clean, and the separate recorder for the engineer's office and indicator for the boiler front.

Special Washers. Kales Stamping Co., 1659 West Lafayette Blvd., Detroit, Mich. A small folder giving a list of special washers of all gages and materials, manufactured by this company. The list contains over a thousand different sizes of washer dies which are maintained in stock for making up washers of any material that can be punched.

Industrial Furnaces. The Surface Combustion Company, 366 Gerard Ave., New York, N. Y. A series of eight bulletins on industrial furnaces and attachments of various kinds, as follows: No. 3G, surface combustion low pressure air gas inspirators; No. 5, type A oven furnaces; No. 6, type B, pot-hardening furnaces; No. 7, type C and type D, soft metal melting furnaces; No. 8, galvanizing baths; No. 17, rivet heaters, No. 24, laboratory furnaces for high temperatures. All of these furnaces and attachments are fully described and illustrated with specifications and performance records.

Hydraulic Turbines. S. Morgan Smith Co., York, Pa. Bulletin No. 112, illustrating and describing a line of Smith hydraulic turbines embodying design and construction features developed over a period of almost fifty years. Steam power tables included have been prepared from tests made at the Holyoke Testing Flume. There are also several tables showing the velocity of water, areas and circumferences of circles, and the loss in head in each 100 ft. length of pipe at different velocities. The illustrations show various power plants and installations of Smith turbines.

Universal Card Holders. Detroit Stamping Co., 3405 W. Fort St., Detroit, Mich. A small folder describing the universal card holder, spacers for milling machine arbors, dies and various types of metal stamping and punching work.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A business man in Spain is interested in the purchase of black iron gas pipe, with fittings; iron-working machinery, such as lathes, drills, planes, punches, and cutters, complete outfit of machinery and tools for making chains, particularly railroad coupling chains, with hooks; machinery of all kinds for machine shops, foundries, forges, dry docks, port works, and railways. Quotations are desired c.i.f. Spanish port. Reference No. 2459.

Firm in the Netherlands wishes to purchase or secure an agency for electric motors, pneumatic tools, all kinds of small oil motors and small steam turbines. Quotations desired c.i.f. Netherlands port. Terms: Cash against documents. Reference No. 2443.

Forthcoming Meetings

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

The Weekly Price Guide

RISE AND FALL OF MARKET

Advances.—No. 2 foundry pig iron up 50c. and Northern basic, $1.48 per gross ton, Cincinnati; scarcity of basic and bessemer iron. Tin quoted at 32¼c. as against 32⅛c. per lb., New York warehouses. Copper rods and wire and brass rods and sheets up ½c.; copper sheets and tubing up 1c. and brass tubing up 2c. per lb. in Cleveland. Mill price of steel bars, $1.70; structural shapes and plates nearing that figure. Quotations, however, on shapes, plates and bars range between $1.60@$1.75 per 100 lb., f.o.b. Pittsburgh.

Declines.—Lead quoted at 6¼c. as against 6½c. per lb., New York. Zinc market easier in tone, prices unchanged; copper dull.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$23.50
Northern Basic	26.50
Southern Ohio No. 2	25.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	29.16
BIRMINGHAM	
No. 2 Foundry	18.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	26.82
Virginia No. 2	28.74
Basic	25.50
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	23.00
No. 2 Foundry, Southern, sil 2.25@2.75	25.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.00
Basic	25.00
Bessemer	25.00

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Detroit	7.0	4.5	3.0
New York	9@10	6.0	3.0
Cleveland	6.75	4.5	2.6
Chicago	5.0	4.5	3.5
Cincinnati	6.0	5.0	4.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.40	3.63	3.15	3.63
No. 12	2.45	3.68	3.20	3.68
No. 14	2.50	3.73	3.25	3.73
No 16	2.70	3.83	3.35	3.83
Black				
Nos. 17 and 21.	3.00	4.15	3.55	4.30
Nos. 22 and 24.	3.05	4.20	3.60	4.30
Nos. 25 and 26.	3.10	4.25	3.65	4.35
No. 28	3.15	4.35	3.90	4.45
Galvanized steel sheets:				
Nos. 10 and 11.	3.15	4.35	3.75	4.45
Nos. 12 and 14.	3.25	4.45	3.85	4.55
Nos. 17 and 21.	3.55	4.75	4.15	4.85
Nos. 22 and 24.	3.70	4.90	4.45	5.00
No. 26	3.85	5.05	4.60	5.15
No. 28	4.15	5.35	4.90	5.45

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6@8	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.85
Hoop steel	3.63	2.81	3.48
Cold rolled strip steel	6.25	8.25	6.15
Floor plates	4.80	4.66	5.08
Cold finished shafting or screw	3.35	3.00	3.40
Cold finished flats, squares	3.85	3.50	3.90
Structural shapes (base)	2.68	2.51	2.68
Soft steel bars (base)	2.58	2.41	2.58
Soft steel bar shapes (base)	2.58	2.41	2.58
Soft steel bands (base)	3.23	3.06	2.58
Tank plates (base)	2.68	2.51	2.38
Bar iron (2.10@2.20 at mill)	2.58	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/32	8.00		12@13
1/8	6.50		11@12
5/32 to 1/4	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.62½
Tin, 5-ton lots, New York	32.25
Lead (up to carlots), St. Louis, 5.65; New York	6.25
Zinc (up to carlots), St. Louis, 5.42½; New York	6.25

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	6@6.12½	7.50	6.25
Copper sheets, base	20.50	21.00	23.00
Copper wire (carlots)	16.00	17.00	16.25
Copper rods (ton lots)	19.00	22.00	19.50
Copper tubing (100-lb. lots)	22.75	24.00	23.00
Brass sheets (100-lb. lots)	16.75	18.00	18.75
Brass tubing (100-lb lots)	20.00	21.00	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Brass wire (carlots)	17.25	17.75	.....
Zinc sheets (casks)	8.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	..
Solder (½ and ½), (caselots)	25.00	22.00	19.00
Babbitt metal (fair grade)	35.00	42.50	36.00
Babbitt metal (commercial)	15.50	16.00	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	11.75	10.25
Copper, heavy, and wire	12.00	11.25	9.25
Copper, light, and bottoms	10.00	9.50	8.25
Lead, heavy	4.75	....	3.65
Lead, tea	4.25	3.50	3.00
Brass, heavy	7.00	6.50	....
Brass, light	6.00	5.00	4.75
No. 1 yellow brass turnings	6.50	6.00	5.00
Zinc	3.00	3.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13½x13½	....	50.00	55.00
Wiping cloths per M., 13½x20½	....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.86	1.00	.96
White lead, dry or in oil	100 lb. kegs.	New York, 12.50	
Red lead, dry	100 lb. kegs.	New York, 12.50	
Red lead, in oil	100 lb. kegs.	New York, 14.00	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville		per net ton	$7.00
Coke, prompt foundry, Connellsville		per net ton	$7.50

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	60–10%	60–10%	60%
1⅛ and 1¼x3 in. up to 12 in	60%	60-10-10%	60-10%
With cold punched sq. nuts	40%	....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	.....	$4.00 off
Button head bolts, with hex. nuts	30%	$3.90 net	.....
Hex. head and hex. nut bolts	35%	....	65-5%
Lag screws, coach screws	60–5%	....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in	45%	60%	50-5%
Bolt ends, with hot pressed nuts	55%	....	55%
Tap bolts, (h. h. plus std. extra of 10%)	15%	....	.....
Semi-finished nuts ⅝ and larger	70%	75–5%	80%
Case-hardened nuts	65%	....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$5.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	5.00	3.50	3.50
Washers, round plate, per 100 lb. Off list	5.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.25	3.50	4.00
Rivets:			
Rivets, $\frac{7}{16}$ in. dia. and smaller	60-10%	70%	60-10%
Rivets, tinned	60-10%	70%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.60	$3.25	$3.10
Cone heads, ditto (net)	3.70	3.35	3.20
1¼ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	....	0.15
⅝ in. diameter *EXTRA*	0.15	....	0.15
½ in. diameter *EXTRA*	0.50	....	0.50
1 in. long, and shorter *EXTRA*	0.50	....	0.50
Longer than 5 in *EXTRA*	0.25	....	0.25
Less than 200 lb *EXTRA*	0.50	....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	55–5%	50%	50-10%
Copper burs	35%	50%	......

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal	0.40	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls). List price, New York, per ply, 12-in. wide, per lin.ft., $2.88.			
Leather:			
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	35%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Conn., Stratford—J. G. Robson, 2180 Elm St.—one No. 2 cutter and creaser (used).

Ill., Aurora—The Blanchard Co., 692 Benton St.—one 42 in. Sheridan die cutting machine and roughing machine.

Kan., Wichita—B. F. Croney, Wichita Pattern Wks., 117 West English St.—power lathe and emery stand.

Kan., Wichita—Fouts Motor Service, 306 South Main St., W. B. Fouts, Purch. Agt.—drill press for power equipment.

Kan., Wichita—C. Hamilton, 144 North Water St.—one drill press for garage.

Kan., Wichita—Kansas Gas & Electric Co., 2336 South Main St., W. Peters, Purch. Wgt.—power lathe and drill press.

Kan., Wichita—W. F. Peters, 233-6 South Main St.—power emery wheel.

Kan., Wichita—South Main Garage Co., 315 South Main St., H. Cummings, Purch. Agt.—power emery wheel and stand.

Kan., Wichita—Taylor Electric Co., 124 North Market St.—power lathe.

Kan., Wichita—C. A. Whitney, 222 East Douglas St.—power drill press and lathe, belting and motor for the manufacture of jewelry.

Kan., Wichita—G. B. Wilson (machinist)—power lathe and drill press.

Md., Baltimore—Western Maryland R.R. Co., Hillen Sta., M. C. Byers, Pres.—machinery and equipment for proposed car shops at Pt. Covington.

Mich., Detroit—W. Eurham, 2964 Chalmer Ave.—three ¾ in. and one 1¼ in. Cleveland milling machines.

Mich., Grand Rapids—Stalter Edge Tool Co., F. N. Statler, Supt.—one Jones and Lamson turret lathe and one heavy duty milling machine.

N. Y., Buffalo—Ellicott Motor Service Co., 19 Wells St.—machinery, tools and full equipment for gas station.

N. Y., Buffalo—E. R. Emig, 871 East Ferry St.—lathe, drills, presses and other equipment for proposed machine shop.

N. Y., Buffalo—C. J. Ernst, 1009 East Ferry St.—machinery and equipment for proposed shop and service station.

N. Y., Buffalo—D. Liberto, 167 Bway—complete equipment, tools, etc., for several garages.

N. Y., Buffalo—G. Schmidt, 58 Grote St.—machinery and equipment including gas tanks, pumps, etc., for proposed garage, repair shop and gas station on Genesee St.

N. Y., Jamestown—Probst Sheet Metal & Roofing Co., 220 East 2nd St.—machinery and equipment for sheet metal plant on 1st St.

N. Y., Ransomville—B. Frey—machinery, tools and equipment for proposed garage and machine shop.

N. Y., Rochester—P. Lettardy, East Ave.—machinery, tools and equipment for garage and repair shop on North Union St.

N. Y., Rochester—H. Sibley, 100 Sibley Blk.—tools and equipment for garage and repair shop on North St.

N. D., Grand Forks—The Union Transfer Co.—automatic screw machine to cut a $\frac{1}{16}$ spiral groove in $\frac{3}{8}$ in. cold rolled shaft, spiral groove to make one full turn in 12 in.

O., Cleveland—The Armature Coil Equipment Co., 3202 Scranton Rd.—medium sized shaper.

O., Cleveland—The Weiss Heating and Plumbing Co., Cedar Ave. near East 55th St.—one 8 ft. Chicago steel bending brake for bending 16 gauge iron. One set Egra plain forming rolls. One 36 in. squaring shear for 18 gauge material. Small turning machine. One No. 10 revoving Whitney punch and other equipment for heating and plumbing trade (new or used).

Pa., Charleroi—G. Woodward—tools and equipment for 3 story addition to repair shop and service station.

Pa., Coraopolis—Standard Steel Spring Co.—shaper.

Pa., New Castle—Southside Garage, Mill and Phillips Sts., H. Gibson, Purch. Agt.—additional machinery, tools and equipment for addition to garage.

Pa., Phila.—Crawford & Co., 1539 Wood St., (pipe hangers and fittings)—machinery and machine tools for new shop, including drilling machines, lathes, belting, shafting, etc.

Pa., Phila.—Department of Transit, 1211 Chestnut St., W. S. Twining, Dir.—one drill press, 24 in.
One electric floor grinder.
One air compressor.
One oil forge.
Quantity of vises, small and large wrenches and other tools.

Pa., Phila.—Enterprise Mfg. Co., 3rd and Dauphin Sts.—equipment for machine shop addition now under construction.

Pa., Phila.—Hill Independent Mfg. Co., Adams and Emerald St.—drill presses, metal stamps and machinery, straightening and bending machinery.

Pa., Phila.—F. Romano, 819 Fitzwater St.—drop forge, lathe and planer.

Pa., Phila.—T. Savill's Sons Co., 1310 Wallace St., manufacturer of plumbing supplies—additional foundry and pipe threading machines, power.

Pa., Phila.—Wayne Mfg. Co., 2624 West Haggert St.—two medium size punch presses (used).

Pa., Pittsburgh—Pittsburgh Malleable Iron Co., 3rd and Summit Sts., J. P. Coates, Dir.—machinery and equipment.

Pa., Warren—Warren Steel Car Co., Inc., address B. Mathis, Mgr.—Modern machinery for the repair of steel tank cars.

Tex., San Antonio—Claussen Lock & Safe Co., 616 Market St., H. H. Claussen, Genl. Mgr.—elec. grinders, drill press and miscellaneous machinery and equipment.

W. Va., Holden—Island Creek Coal Co.—equipment for proposed machine shop.

W. Va., Princeton—Princeton Automobile Accessories Co., R. F. Forkner, Mgr.—lathe, drill press and smaller machine shop tools (new or used).

W. Va., West Union—West Union Machine & Supply Co., W. L. Lynn, Secy.—one 24 in. x 14 ft. lathe, one 20 in. shaper, power hack saw, electric light plant equipment 100 K.W. A.C. generator.

Wis., Beloit—J. H. Saris, 412 Broad St.—power machinery for proposed garage and repair shop.

Wis., Mercer—D. L. White—machinery and equipment for auto repairing.

Wis., Milwaukee — C. Schoebel, 1092 Richards St.—combination punch and shear for sheet metal.

Wis., New London—F. P. Zang—sander.

Wis., Oshkosh—Oshkosh Cylinder Grinder Co., c/o J. Robb, 126 Park Ave.—grinders.

Wis., Sheboygan—W. A. Knaak Motor Co., South 13th St. and Georgia Ave.—machinery for proposed auto repair shop.

Wis., Sheboygan—E. W. Tupper, 1328 North 7th St.—electric pumps for proposed garage and filling station on St. Clair St.

Ont., Toronto—F. Passmore, 925 Bathurst St.—repair equipment and gasoline supply stand and tank for proposed garage and repair shop.

Machinery Wanted

Ark., Little Rock—T. K. Falconer, 2313 West 13th St.—special machinery for the manufacture of chain protectors for automobile tires, for proposed plant at Texarkana.

Cal., Redlands—J. H. Strait & Co.—machinery and equipment for dehydrating and cider manufacturing plant.

Cal., Reedley—Union High School Trustees—equipment for proposed manual training school.

Cal., San Francisco—Western Newspaper Union, 32 Clay St.—Goss Comet or Duplex double drive model press.

Del., Wilmington—J. D. Sisler Co., 3rd and King Sts.—refrigerating machinery and equipment for proposed cold storage plant.

Fla., Jacksonville—Jacksonville products Co., F. Burkhart, Mgr.—additional machinery for fruit canning plant.

Fla., Leesburg—Municipal Ice Plant—additional machinery for ice plant.

Idaho, Nampa—Idaho Sash, Door & Glass Co.—saws, planers and other machinery and equipment for proposed factory.

Ind., Plymouth—Schlosser Bros.—refrigeration and ice cream making machinery.

La., New Orleans—W. W. Carre Co., Ltd., 814 Hibernian Bldg.—machinery for lumber and finish mill.

Mich., Grand Rapids—Adzet Printers Supply Co., 41 Ellsworth Ave.—one Miehle press.

Mich., Milford—T. S. Hubbell—caterpillar crane, 12 ton, 40 ft. boom, and 1 yard bucket.

Mich., Munising—Munising Fdry. Co.—foundry machinery and equipment for branch plant at Hibbing, Minn.

Mo., Kansas City—J. L. Zidson, 4507 Michigan Ave.—rock crusher and other power rock machinery, also belting.

N. Y., Albion—T. Page Canning Co.—machinery and equipment for medium size canning plant.

N. Y., Bolivar—Bolivar Fdry. Co., Inc., W. J. Brannen, Pres.—equipment for small foundry.

N. Y., Buffalo—Allan Mfg. & Welding Co., 163 Adams St., R. Siemer, Secy.—hand tools, drills, etc., for use in small welding shop.

N. Y., Buffalo—Drive Your Car Co., Inc., 280 Niagara St., G. H. Buhr, Pres.—one 500 gal., one 1,000 gal. tank, pumps and other equipment for gasoline and service station.

N. Y., Buffalo—C. A. Klocke, William St.—gas pump, oil pump, 500 gal. tank, and small tools and equipment for garage and service station.

N. Y., Buffalo—L. Kradel, 1909 Bway.—one 1,060 gal. gas tank and pump for auto livery service.

N. Y., Buffalo—Kutz Bros., c/o R. G. Kutz, Purch. Agt.—complete bakeshop equipment for proposed shop at 1750 Main St.

N. Y., Buffalo—T. Parisi, 1471 Jefferson Ave.—complete machinery and equipment, electrically operated, for shoe repair shop.

N. Y., Buffalo—G. Rath, 1644 Bailey Ave.—one 1,000 gal. tank and gasoline pump, also compressor for tire service.

N. Y., Buffalo—Ye Old Time Baking Co., Inc., 1361 Fillmore Ave., A. E. Robinson, Pres.—ovens and equipment for large bakery at 623 Williams St.

N. Y., Corning—Dairymen's League, O. Wolcott, Pres.—machinery and equipment for proposed milk plant and condensory.

N. Y., Dansville—Maloney Bros. & Wells—machinery and equipment for packing plant.

N. Y., Fredonia—Fredonia Seed Co., Inc., 28 South Water St., H. F. Lupean, Secy.—special additional machinery and equipment for proposed seed factory on Main St.

N. Y., Jamestown—Black Belt Corp., 15 East 15th St., F. E. Clark, Genl. Mgr.—machinery and equipment for proposed addition to plant.

N. Y., Jamestown—Rappole & Robbins, 303 Lafayette St.—air compressor for tire service station.

N. Y., Lockport—Hall & Carrey Weaving & Belting Co.—machinery and equipment for the manufacture of woven textiles, etc.

N. Y., New York—L. Mundet & Son, Inc., 461 8th Ave.—woodworking band saw with 5 to 6 in. blades.

N. Y., New York—Standard Cloth Co., Inc., 342 Madison Ave., (converters of cotton goods), A. Mannheimer, Secy.—cotton cloth cutting machine for cutting 4 to 6-ply cotton at a time.

N. Y., Phelps—A. S. Rathbun—machinery and equipment for flour mill.

N. Y., Red Creek—Central Packing House—machinery and equipment for proposed fruit packing plant.

N. Y., Rochester—Amer. Woodworking Mchy. Co., Lyell Ave.—machinery and equipment for proposed addition to factory.

N. Y., Rochester—Glare Control Headlight Co., Inc., c/o R. L. Curtis, Pres.—machinery for the manufacture of dirigible headlights.

N. Y., Rochester—J. C. Moore, 65 Stone St.—Miller press feeder 10 x 15 for Chandler & Price power press, new series.

N. Y., Rochester—Mt. Carmel Grape Juice Co., c/o E. H. Verhurst, 463 Augustine St.—machinery for the manufacture and bottling of grape juice.

N. Y., Rochester—Rochester Packing Co., 900 Maple St.—machinery and equipment for addition to packing house.

N. Y., Sodus—Sodus Fruit Farm, Inc.—large machines for pitting cherries, to be operated by motor power.

N. Y., Webster—W. Kittleberger, North Ave.—machinery and equipment for fruit canning plant at Walworth.

N. Y., Webster—Webster Basket Co.—machinery for basket manufacturing plant at Rochester.

N. C., Charlotte—F. Hayman, North Tryon St.—machinery and equipment for refrigeration and cold storage plant.

O., Cleveland—L. S. Apple, 617 Schofield Bldg., (stove plate enamel plant)—two large smelters; 10 furnaces (to be lined with carborundum brick); 20 spraying booths; 2 milling machines; electric pickling vats; racks and miscellaneous equipment for proposed plant.

O., Cleveland—C. S. Morgan, 1545 East 18th St.—machinery and equipment for proposed Ignition School.

O., Niles—Niles Tire & Rubber Co., F. E. Turrell, Dir.—machinery for the manufacture of tires and rubber products.

Pa., Bridgeport—J. Lees & Sons Co., Dyers, J. L. Eastwick, Purch. Agt., vats, tanks, agitators, drying machines, etc.

Pa., Chester—Neil-A-May Plush Mills, 6th and Madison Sts., F. Lees, Purch. Agt.—narrow looms and other machinery.

Pa., Coraopolis—Standard Steel Spring Co.—one 10 ton overhead crane, 60 ft. span.

Pa., New Castle—Bd. of Educ.—engine lathes, woodworking machinery, etc.

Pa., Norwood—Pennsylvania Equipment Co.—one 10-ton electric traveling crane, 25 to 35 ft. span.

Pa., Phila.—B. Bernstein & Sons, 1401 North 3rd St., M. Bernstein, Purch. Agt.—additional woodworking machinery for factory.

Pa., Phila.—Better Cake Co., 1034 South 57th St., c/o J. G. Patton—additional machinery for bakery, including dough mixer, conveyor, electric stoves, etc.

Pa., Phila.—C. B. Cochrane & Co., Kensington Ave. and Butler St.—additional narrow looms for carpet mills.

Pa., Phila.—Columbia Carpet Mills, 3rd and Huntingdon Sts.—additional electric looms.

Pa., Phila.—I. J. Horstman & Co., 18th and Washington Sts.—spindles, twisters and other machinery.

Pa., Phila.—F. P. Woll & Co., Tacony and Church Sts., manufacturers of curled hair)—machinery of various kinds and tools for machine shop.

Pa., Phila. — Womens Hospital, 2137 North College Ave., J. L. Maull, Purch. Agt.—Printing presses, 7 x 11 Chase motor driven, automatic feed.

Pa., Sharon—N. Polus—equipment for sand and gravel bank at New Castle.

Pa., Sharon—Valley Packing & Provision Co.—ice plant, coolers and other equipment for proposed addition to packing plant.

Pa., Slatedale—The Blue Mountain Slate Co.—machinery and equipment for slate factory now under construction.

Pa., Washington—Observer Publishing Co.—printing machinery and equipment for proposed plant on Main St.

Tenn., Nashville—Hercules Silica Asphalt Co., 207 Stahlman Bldg.—machinery for the development of rock asphalt including conveyors, air compressors, drills, dinky engines, relaying rail, etc.

Tex., Amarillo—Merchants Produce Co.—machinery and equipment for proposed 30 ton ice plant.

Va., Abingdon—Abingdon Lumber Corp., T. M. Clapp, Secy.—machinery for proposed addition to lumber mill.

Va., Farmville—Farmville Ice Cream Co., E. S. Martin, Secy. and Mgr.—machinery for making ice cream (new or used).

Va., Staunton—Staunton Coca-Cola Bottling Wks., W. L. Sams, Secy. and Mgr.—machinery and equipment for plants at Staunton and Charlottesville (new or used).

W. Va., Bluefield—C. L. Seyler Lumber Co., c/o C. L. Seyler—saw mill and logging equipment including dry kiln, band mill, planer mill, locomotive, rails, etc., for plant at Graham, Va. (used or new).

W. Va., Lansing—Shawner Constr. Co., J. A. Ellison, Mgr.—portable planer and matcher (used).

W. Va., Logan—Guyan Machinery Shops—power driven scroll saw, band wheel for 6 ft. Smith Myers & Schnur mill.

Wis., Athens—Braun Bros.—machinery for planing mill, belt driven.

Wis., Cudahy—H. M. Shoe Co.—shoe working machinery.

Wis., Eau Claire — Chippewa Valley Produce Co.—refrigerating machine and cooling apparatus for cold storage plant.

Wis., Fort Atkinson—Fort Atkinson Canning Co.—canning machinery and crating machine.

Wis., Merrill—Wisconsin Mfg. Co., c/o E. Chauvin—special machinery for proposed factory for the manufacture of sweeping compound.

Wis., Milwaukee—Nowiny Publishing Co., 618 Mitchell St.—paper cutting machine.

Wis., Neillsville—Neillsville Canned Food Co., A. G. Shedden, Purch. Agt.—canning machinery.

Wis., New London — Amer. Plywood Corp., F. P. Zang, Mgr.—sander, taping machine textile dryer and special machinery.

Wis., Racine—Clark Engineeering Co., 4th St. and Lake Ave.—loop winding machine for winding coils in motor repair shop.

Wis., Racine—Clark Eng. Co., Lakeview Bldg., 9th and Lake Ave.—loop winder for winding motor coils in motor repair shop (used).

Wis., Sheboygan—A. H. Ehrlich, 1123 North 8th St.—vulcanizing and power equipment.

Wis., South Kaukauma—H. J. Fassbender, R. F. D. No. 1—churns, mixers, dairy machinery and cooling apparatus.

Wis., Stevens Point—E. B. Schwohn, 215 Strong Ave.—machinery for shoe repair shop at Appelton.

Wis., Wausau—D. L. Bellinger, 1024—3rd St., Machinists—traveling crane.

Wis., Wausau—Gromwald & Co., c/o C. Westberg, Monuments—power saws and polishing mills.

N. B., Brockway—E. Vail—saw mill machinery and other equipment.

Ont., Lindsay—J. Hadley—machinery and equipment for proposed shingle factory.

Ont., Listowel—Pfeffer Milling Co.—equipment for flour mill.

Ont., London—The City Council, H. A. Brazier, City Hall, Engr.—equipment for a carrier system to carry cinders from the incinerator across the river about 1,000 ft.

Ont., Millbank—H. E. Rats Co.—machinery, engine and general equipment for saw-mill.

Ont., Niagara Falls—U. S. Light & Heat Co., manufacturer of batteries, auto starters, etc.—machinery and equipment for plant which is being remodeled.

Ont., Tillsonburg—W. Ruth—equipment for proposed bakery.

Ont., Welland—Welland Cotton Mills, manufacturers of fine and coarse yarns—machinery and equipment including looms, spinners, etc., for proposed million dollar cotton mills on Queen and Duncan Sts.

Que., Montreal—Empire Fdry., 128 Wellington St.—machinery and equipment for proposed brass foundry addition.

Metal Working Shops

Cal., Los Angeles—California Electric Heating Co., 517 Chapman Bldg., plans to build a factory, for the manufacture of combined electric heater and fan, in southeast part of city. Estimated cost $100,000. W. H. Vance, Vice-Pres. Engineer and architect not selected.

Ill., Chicago—W. F. Block & Co., 1845 Lamon Ave., is having plans prepared for the construction of a 1 and 2 story 180 x 200 ft. factory, for the manufacture of sheet metal products, at 1828 Lamon Ave. Estimated cost $100,000. H. H. Green, 304 South Wabash Ave., Archt.

Ill., Chicago—R. R. Cenek, Archt., 118 North La Salle St., will soon receive bids for the construction of a 1 story, 75 x 160 ft. factory on Cottage Grove Ave. and 48th St., for the Auto Truck Body Builders Co. Estimated cost $35,000.

Ill., Chicago—K. Kaufman Bros., c/o Dubin & Eisenberg, Archts., 14 West Washington St., will soon award the contract for the construction of a 3 story, 62 x 125 ft. factory and garage, on Fillmore St. Estimated cost $60,000.

Mass., Middleton—The Middleton Motor Co., Danvers, plans to build a 2 story garage, service and repair shop here. Estimated cost $40,000. Private plans.

Mich., Detroit—Fisher Body Co., General Motors Bldg., has awarded the contract for the construction of a 6 story, 102 x 979 ft. factory addition, for the manufacture of automobile bodies. Estimated cost $2,000,000.

Minn., Minneapolis—Bd. of Park Commissioners, J. A. Ridgway, Secy., City Hall, will soon award the contract for the construction of 3 story, 43 x 144 ft. shops and warehouses, on Lyndale Farmstead. Estimated cost $75,000. Magney & Tusler, 126 South 9th St., Archts.

N. Y., Buffalo—C. J. Ernst, 1009 East Ferry St., plans to build a small shop and service station. Estimated cost $12,000. Architect not announced.

N. Y., New York—Commissioner of Plant & Structures, 18th floor, Municipal Bldg. will receive bids until June 23, for the construction of a repair shop, for the department of street cleaning, at 16th St. and Ave. C.

N. Y., New York—The Transit Commission, 49 Lafayette St., has awarded the contract for the construction of additional repair shops on Lenox Ave. and West 148th St. Estimated cost $300,000. Private plans.

O., Cleveland—E. Schimmelman, 17702 Lake Shore Blvd., has had plans prepared for the construction of a 1 story, 54 x 118 ft. garage and commercial building. Estimated cost $50,000. Private plans.

O., Cleveland—J. Struziak, 8126 Wade Park Ave., has completed plans for the construction of a 1 story, 17 x 43 ft. garage and boiler room. Estimated cost $40,000. Private plans.

O., Dayton—Dayton & Troy Auto Co., 2nd and St. Clair Sts. is having plans prepared for the construction of a 5 story, 85 x 200 ft. garage and auto sales building. Estimated cost $180,000. Architect not selected.

O., Lakewood (Cleveland P. O.)—W. C. Schultz, 11913 Detroit Ave., has awarded the contract for the construction of a 1 story, 70 x 90 ft. garage and commercial building on Detroit and Love Aves. Estimated cost $40,000. Noted June 8.

Pa., Coraopolis—Standard Steel Spring Co. is receiving bids for the construction of a 1 story, 64 x 141 ft. factory addition (crane building).

Pa., Erie—Union Iron Wks., 15th and Cascade Sts., is receiving bids for the construction of a 1 and a 3 story, 160 x 310 ft. addition to its plant. G. W. Bach, Mgr. Private plans.

Pa., Johnstown—J. Walling & Co., 518 Washington St., Plans to build a 3 story, 74 x 132 ft. garage, on Railroad St. Estimated cost $150,000.

Pa., Lancaster — Rowe-Stuart Motors Corp. will build a 120 x 271 x 327 ft. factory for the manufacture of Anderson truck tires, on Fountain Ave. between Rossmere and New Holland Aves.

Pa., New Brighton—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, is having plans prepared for the construction of a 1 story, 100 x 203 ft. machine shop, here. Estimated cost $100,000. W. H. Garver, c/o owner, New Brighton Company, Engr.

Pa., Phila.—J. J. Greenberg Co., Morris Bldg., has awarded the contract for the construction of a 5 story, 55 x 150 ft. sales and service station at 1409-11 North Broad St. Estimated cost $125,000. Noted May 18, 1922.

Pa., Phila.—L. J. Kolb, 10th and Reed Sts., plans to build a 1 story, 60 x 71 ft. and a 1 story, 175 x 200 ft. garage at 1418-28 Mellon St. Estimated cost $80,000. C. B. Weldon, 10 South 18th St., Archt.

Pa., Phila.—H. P. Weldon, Archt., 10 South 18th St., is receiving bids for the construction of a 2 story, 42 x 60 ft. foundry, at 635 North Watts St., for T. Savills Sons, 1310 Wallace St. Estimated cost $10,000.

Pa., Pittsburgh—Fleishman Co., 701 Washington St., New York City, will soon award the contract for the construction of a 1 and 2 story, 75 x 175 ft. garage, warehouse and office building on Alley and Western Sts., here. Estimated cost $50,000. L. L. Teeman, c/o owner, Archt.

Pa., Pittsburgh—Haller Baking Co., 260 North Denniston Ave., has awarded the contract for the construction of a 2 story 86 x 92 ft. bakery addition and garage, on Shakespeare St. Estimated cost $50,000.

Pa., Warren—Warren Steel Car Co., Inc., plans to rebuild its plant which was destroyed by fire. Estimated cost $75,000. B. Mathis, Mgr. Architect not announced.

Va., Brattleboro—The Presby-Leland Co., Barre, has awarded the contract for the construction of a 1 story cutting shed, a 1 story machine shop, a 1 story office building, and storage sheds, here. Estimated cost $100,000. Private plans. Noted June 1, 1922.

Va., Norfolk—Johnson Motor Corp., 751 Granby St., has awarded the contract for the construction of a garage. Private plans.

Va., Norfolk — Lowenberg — Goodman Corp., 127 Granby St., has awarded the contract for the construction of a 91 x 305 ft. garage on Granby and 11th Sts. Estimated cost $194,000.

W. Va., Holden—Island Creek Coal Co. plans to build a machine shop to replace the one destroyed by fire. Estimated cost $75,000. Architect not announced.

Wis., Beloit—J. H. Saris, 412 Broad St., is receiving bids for the construction of a 2 story, 100 x 130 ft. garage. Estimated cost $50,000. J. F. Hetherington & Son, Goodwin Blk., Archts.

Wis., Sheboygan—W. A. Knaak Motor Co., South 13h St. and Georgia Ave., is having plans prepared for the construction of a 2 story, 50 x 95 ft. garage. Estimated cost $50,000. E. A. Stubenrauch, 629 North 8th St., Archt.

Wis., Sheboygan—E. W. Tupper, 1328 North 7th St., has awarded the contract for the construction of a 1 story, 50 x 60 ft. garage and filling station on St. Clair St. Estimated cost $40,000. Private plans.

Ont., Toronto—F. Passmore, 925 Bathurst St., plans to build a 2 story, 40 x 80 ft. garage and repair shop. Estimated cost $30,000.

General Manufacturing

Cal., Dinuba—Sun Maid Raisin Growers, Holland Bldg., Fresno, are having plans prepared for the construction of an 80 x 140 ft. packing plant, here. Trewhitt-Shields Co., Rowell Bldg., Fresno, Archts.

Cal., Eureka—Eureka Woolen Mills, Bway and Whipple Sts., has awarded the contract for the construction of a 2 story addition to its plant. Estimated cost $12,000. F. E. McGee, Vice-Pres.

Cal., Reedley—Union High School Trustees will receive bids until June 30 for the construction of 6 high school buildings, including administration, gymnasium, manual training, cafeteria, etc. Estimated cost for building and equipment, $450,000. Trewhitt & Shields, Rowell Bldg., Fresno, Archts.

Cal., San Francisco—O'Brien Bros., Inc., Archts., 240 Montgomery St., are receiving bids for the construction of a 2 story printing plant on Howard St., for L. Laurie, Mills Bldg. Building to be leased to Leighton Press, 516 Mission St. Estimated cost $25,000.

Cal., San Francisco—W. N. Brunt, 766 Mission St., has awarded the contract for the construction of a 2 story printing plant, on Minna and 7th Sts. Estimated cost $40,000.

Cal., San Francisco—Wayne Oil Tank and Pump Co., 4th and Harrison Sts., has awarded the contract for the construction of a 1 story shop and office building on 4th and Perry Sts. Estimated cost $10,000.

Fla., Lakeland—Non-Acid Fertilizer and Chemical Co. is having plans prepared for the construction of a fertilizer plant. H. D. Mendenhall, Lakeland, Archt.

Fla., Tampa—Tampa Gas Co., 201 Madison St., plans to build a gas plant extension. Estimated cost $50,000. R. Nettles, Chapin and Boulevard Sts., Engr.

Ga., La Grange—Dunson Mills has awarded the contract for the construction of a 1 story 111 x 132 ft. addition to their weave shed.

Ind., Kokomo—Kokomo Gas & Fuel Co., c/o C. A. Moore, Pres., is having plans prepared for the construction of a manufacturing plant. Estimated cost $500,000. The Kopper Co., Union Arcade Bldg., Pittsburgh, Pa., Engrs.

Me., Portland—Confederated Home Abattoir Corp., plans to build a meat packing and ice manufacturing and refrigeration plant. Estimated cost $500,000. Architect not announced.

Md., Baltimore—Kaufman Beef Co., Union Stock Yards, had plans prepared for the construction of a 3 story, 110 x 120 ft. packing plant. Estimated cost $125,000. Himmelsbach and Schlich, 136 Liberty St., New York, Engrs.

Mass., Boston—The Ginter Co., 369 Congress St., has awarded the contract for the construction of a 4 story, 40 x 80 ft. bakery on Shawmut St. Estimated cost $50,000.

Mass., Ipswich—Hayward Hosiery Co. has awarded the contract for the construction of a 1 story, 45 x 135 ft. hosiery mill. Estimated cost $15,000. Private plans. W. E. Hayward, Pres.

Mass., Lynn—A. M. Creighton, 27 Willow St., has awarded the contract for the construction of a 4 story, 50 x 225 x 255 ft. factory for the manufacture of shoes. Estimated cost $300,000.

Minn., Cloquet—The Northwest Paper Co. has awarded the contract for the construction of a 3 story paper mill. Estimated cost $500,000. Noted Feb. 9, 1922.

Minn., Cloquet—Northern Lumber Co. is building a 2 story, 75 x 185 ft. planing mill. Estimated cost $30,000.

N. Y., Buffalo—Harvey Laundry Co., Inc., 90 Chenango St., plans to build a laundry. Estimated cost $15,000. Private plans. Architect not announced.

N. Y., Lockport—A. W. Jack Corp. has awarded the contract for the construction of a paper mill, on Mill and Transit Rds.

N. Y., Niagara Falls—Kimberly-Clark Paper Co., Packard Rd., has awarded the contract for the construction of one 50 x 100 ft. and one 50 x 120 ft. factory building for the manufacture of paper. Estimated cost $60,000.

N. Y., Red Creek—Central Packing House has awarded the contract for the construction of a 50 x 100 ft. fruit packing plant.

N. C., Brevard—H. C. Brevard, plans to build an ice and cold storage plant. Estimated cost including machinery $12,000 to $15,000. Engineer not selected.

N. C., Winston-Salem—Bailey Bros., plan to build a 5 story, 63 x 154 ft. cigarette factory. Estimated cost $100,000. Lockwood, Green & Co., Charlotte, Archts.

O., Cleveland—A. Zicha, 3587 East 108th St., has awarded the contract for the construction of a 2 story, 42 x 66 ft. bakery and commercial building, at 4110 Memphis Ave. Estimated cost $40,000. Private plans.

O., Columbus—Department of Public Welfare, 9th and Oak Sts., will soon award the contract for the construction of a laundry and bakeshop on West Broad St. Estimated cost $50,000 and $30,000 respectively. R. S. Harst, Ohio-Hartman Bldg., Archt.

Pa., Phila.—Bayuk Bros., Inc., 3rd and Spruce Sts., will soon receive bids for the construction of a 4 story, 84 x 109 ft. factory, for the manufacture of cigars, at 10th and Bainbridge Sts. Estimated cost $250,000. E. A. Wilson, 1208 Chestnut St., Archt.

Pa., Phila.—Blumenthal Bros., Margaret and James Sts., has awarded the contract for the construction of a factory for the manufacture of cocoa products. Estimated cost $200,000. Ballinger Co., 12th and Chestnut Sts., Archts.

Pa., Phila.—C. B. Cochrane, Kensington Ave. and Butler St., plans to build a 3 story, 40 x 200 ft. rug factory. Estimated cost $50,000. W. Steele & Sons, 16th and Arch Sts., Engrs.

Pa., Phila.—Columbia Carpet Mills, 3rd and Huntington Sts., has awarded the contract for the construction of a 5 story, 40 x 114 x 146 ft. carpet mill, on 3rd and Cumberland Sts.

Pa., Phila.—Gill Glass Co., Amber and Venango Sts., has awarded the contract for the construction of a 2 story, 20 x 86 ft. factory. Estimated cost $25,000.

Pa., Phila.—W. F. Newberry Co., Otis Bldg., Engrs., are receiving bids for the construction of 1 story, 20 x 25 ft. and 1 story, 70 x 200 ft. factory buildings for the manufacture of silks, on Front and Olney Aves., for Heinz Mfg. Co., 2120 West Tioga St. Estimated cost $80,000.

Pa., Pittsburgh—Newspaper Printing Co., Gazette Sq., has awarded the contract for the construction of a 3 story, 81 x 84 x 107 ft. addition to their plant. Estimated cost $175,000. E. B. Lee, Chamber of Commerce Bldg., Archt.

Pa., Reading—Central Abattoir Co., Chestnut St., had plans prepared for the construction of a 3 story plant addition. Estimated cost $125,000. Himmelsbach and Schlich, 136 Liberty St., New York, Engrs.

Pa., Rochester—Amer. Borax Co., c/o Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, has awarded the contract for the construction of 3 story, 50 x 100 ft., 1 story, 50 x 100 ft., and 1 story, 80 x 50 ft. factory and power plant, here. Estimated cost $90,000. Private plans.

Pa., Shamokin—Croninger Packing Co. has awarded the contract for the construction of a 5 story, 28 x 52 ft. and 50 x 77 ft. packing house. Estimated cost $200,000. Noted April 13, 1922.

Pa., Sharon—Sharon Furniture Co. plans to rebuild a factory recently destroyed by fire, for the manufacture of furniture. Estimated cost $25,000. Architect not announced.

Pa., Williamsport—Peters Packing Co., has awarded the contract for the construction of a 4 story, 68 x 68 ft. packing house. Estimated cost $130,000. C. B. Comstock, 110 West 40th St., New York, Archt.

Tex., Grand Prairie—Prairie Refining Co., has awarded the contract for the construction of a refinery. Estimated cost $40,000. I. B. Walker, Pres.

Va., Buena Vista—United Chemical Products Co., 609 Chamber of Commerce Bldg., Pittsburgh, is receiving bids for the construction of a 1 story, 41 x 44 ft. plant here, for the manufacture of fertilizer. Estimated cost $45,000. F. B. Deane, c/o owner, Archt.

Va., Norfolk—The City Gas Co., has awarded the contract for the construction of gas holder, boiler works, and extension to gas mains at present plant, on Monticello Ave. Estimated cost $122,000.

W. Va., Huntington—Perry Norvell Shoe Co., has awarded the contract for the construction of a 6 story shoe factory, on Guyan and 25th Sts. Estimated cost $100,000.

Wis., Fair Water—Fair Water Co., has awarded the contract for the construction of a 2 story, 70 x 85 ft. dairy. Estimated cost $50,000.

Wis., Madison—The City of Madison, N. C. Buser, Clerk, plans to build a 20 ton auto scale for public use. E. E. Parker, Engr.

Wis., Madison—Northern Wisconsin Oil Co., De Pere St., Menasha, has awarded the contract for the construction of a 1 story, 50 x 110 ft. filling station on Gilman St., here. Estimated cost $45,000. Address G. Mayer, Menasha.

Wis., Milwaukee—Claybourn Process Corp., c/o H. J. Esser, 82 Wisconsin St., Archt. and Engr., will soon award the contract for the construction of a 1 story, 117 x 200 ft. building for the manufacture of a color printing process, on Humboldt Ave. Plans are also being prepared for the construction of a 1 story, 30 x 80 ft. boiler room and heat treating building, also a 1 story, 100 x 182 ft. administration building.

Wis., Omro—Omro Co-operative Butter & Cheese Co. has awarded the contract for the construction of a 1 story, 69 x 74 ft. creamery and cheese factory. Estimated cost $42,000.

Ont., Huntsville—Muskoko Wood Mfg. Co., plans to rebuild its plant partially destroyed by fire. Estimated cost including machinery, etc., $100,000.

Ont., Welland—Empire Cotton Mills, Ltd., has awarded the contract for the construction of an addition to its mills. Estimated cost $250,000. Noted March 23.

Ont., Welland—Welland Cotton Mills, Ltd., plans to build a cotton mill in two units, one for coarse yarns and the other for fine yarns, on Queen and Duncan Sts. Estimated cost $1,000,000. R. Cooper, Secy. Private plans.

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Railroad Repair-Shop Work

Cutting and Compressing Packing Rings—Portable Keyseating Device—Tools for Turning Spherical Joints on Steam Pipes—A Convenient Step Ladder

BY S. ASHTON HAND
Associate Editor, *American Machinist*

IN MANY railroad shops packing rings are cut apart with a hacksaw, the cuts being made at an angle so as to let the point at one part of the ring overlap that of the other part.

At the Huntington, W. Va., shops of the Chesapeake & Ohio Railway, where the data and illustrations for this article were secured, packing rings are cut apart on a shaper, as shown in Figs. 1 and 2. In Fig. 1 packing rings for piston valves are being cut apart, four at a time. The rings, as may be seen, are of an L-shaped section. The fixture is double and holds two sizes of rings, one at each end and each compartment is curved at the bottom, as at *A*, to the same radius as that of the rings to be held.

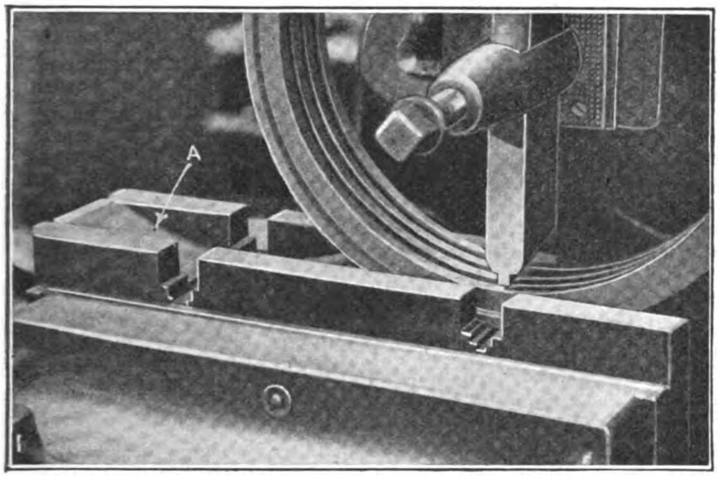


FIG. 1. SPLITTING VALVE PACKING RINGS.

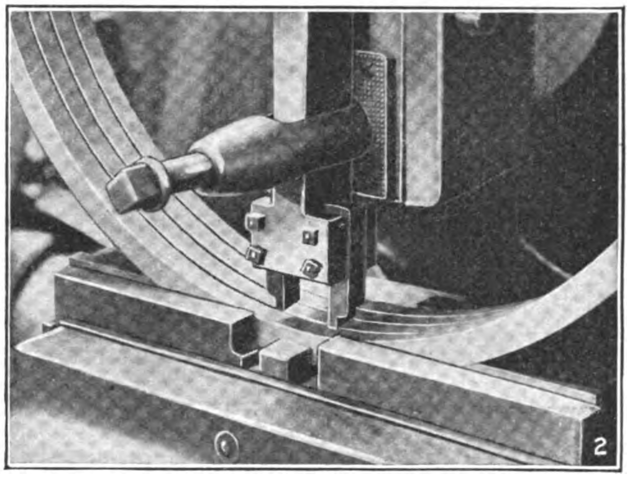


FIG. 2. SPLITTING PACKING RINGS

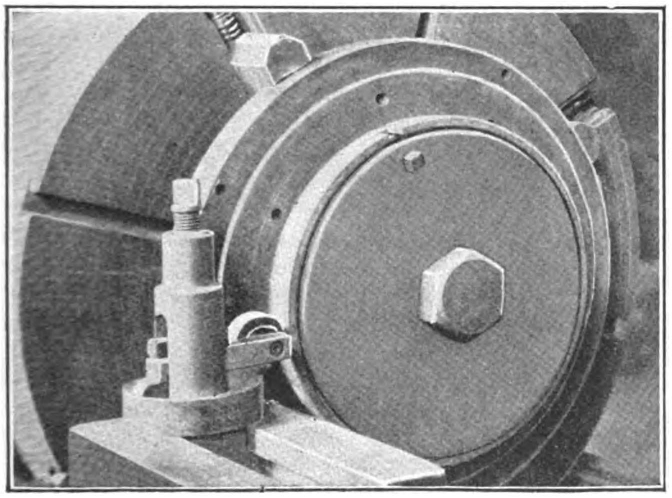


FIG. 3. COMPRESSING VALVE-PACKING RINGS.

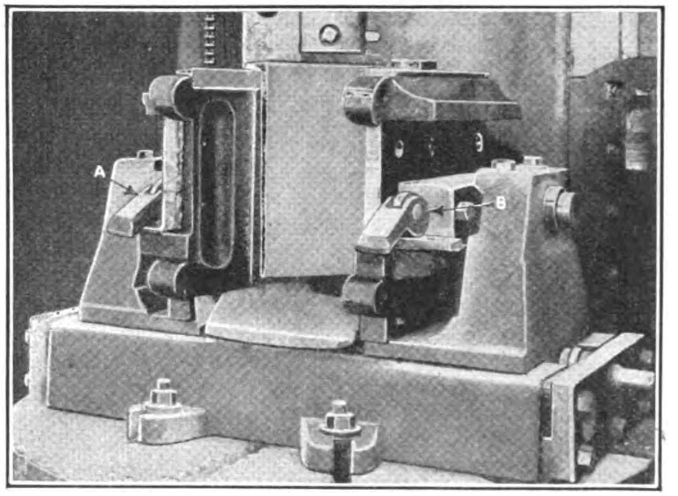


FIG. 4. BORING THE CROWN BRASS IN A DRIVING BOX

The tool is shouldered, the corners of the shoulders being rounded. The narrow part of the tool cuts the right amount out of the rings to give them the proper spring when closed. Before the rings are severed, the shouldered part of the tool cuts a slot with rounded corners in the inner webs so that when each ring is closed the slot will fit over a pin in the valve head to locate the ring and keep it from turning.

The rings shown in Fig. 2 are for main pistons. As these rings are much larger than valve rings, more is required to be cut out of them to give the proper tension when closed. As may be seen, two offset tools set in a holder are used, one side of each tool having a shoulder with a rounded corner to serve the same pur

pose as the rounded corners on the tool shown in Fig. 1.

After cutting apart, valve packing rings are compressed and the outsides turned to fit the valve chamber. The operation of compressing a ring is shown in Fig. 3. The ring is held by the web between the plane surfaces of a plate chuck and its cover by a pressure great enough to hold it against movement by its initial spring. While slowly revolved in the lathe, the roller tool shown is gradually fed against the outside of the ring until the ends meet. The cover is then screwed up tightly by the screw in the center and the ring machined on the outside. The small screw to be seen in the upper part of the cover, enters the slot in the web of the ring and prevents any slippage while it is being machined.

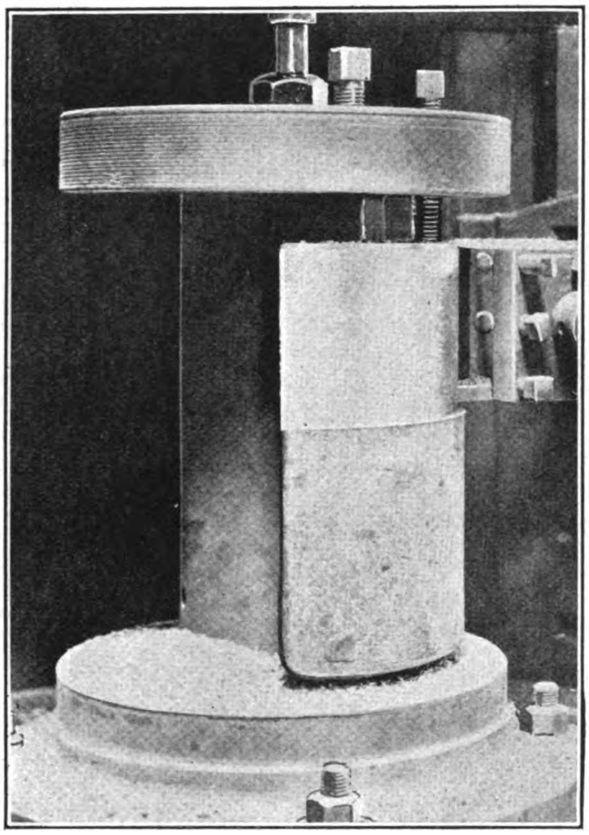


FIG. 5. TURNING THE OUTSIDE OF A CROWN BRASS

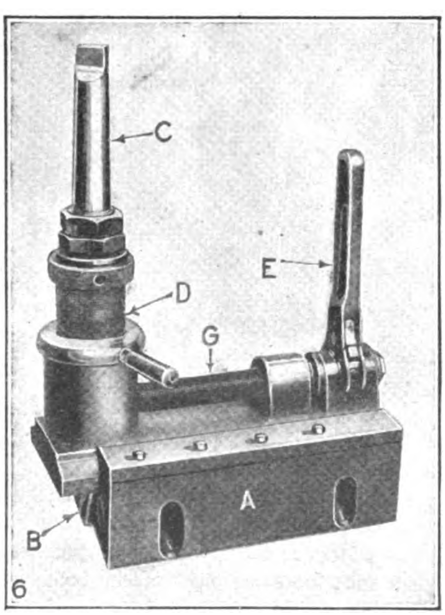
In this shop the Moss chuck, described in the article on the Richmond shops, is used on the vertical boring mill for boring driving boxes; but instead of using wedges to hold the boxes down on the parallels, cams attached to the chuck jaws, as at *A* and *B* in Fig. 4, are provided.

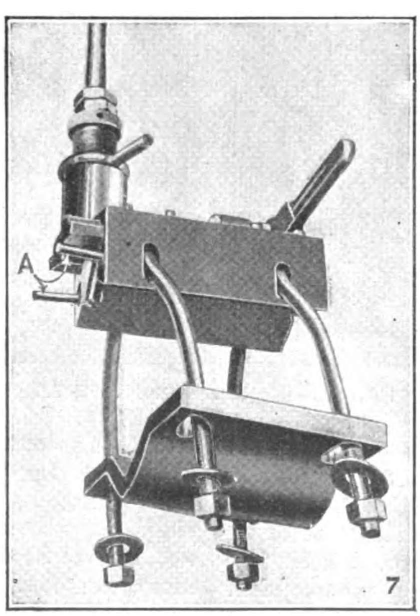
Machining the outside of a crown brass in a Bullard vertical lathe is shown in Fig. 5. The brass is centered by the column of the fixture and held at bottom and top between cup-pointed screws in the base and upper flange.

The tool shown in Figs. 6 and 7 is used for keyseating axles, both for the wheels and the eccentrics. Referring to Fig. 6, the body *A* has a V-groove planed in the under side for locating it on the axle to which it is clamped. The end mill at *B* is driven by a portable pneumatic motor through the taper shank *C*. The cut is regulated for depth by the threaded sleeve *D* while the cutter is fed longitudinally by the ratchet lever *E* through the screw *G*.

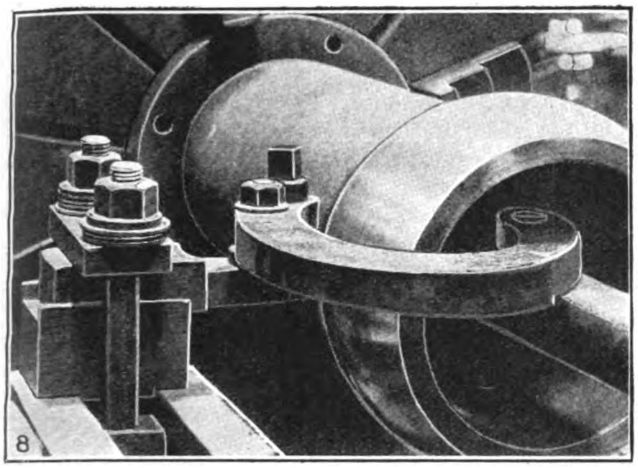
The device, as shown in Fig. 7, is equipped with its bolts and clamp for attachment to the axle. In order to save weight, the device has been made narrow and the bolts bent to span the axle. The bolts are held in the body of the device by the pins *A* which pass through eyes in their upper ends, so that they can be readily detached.

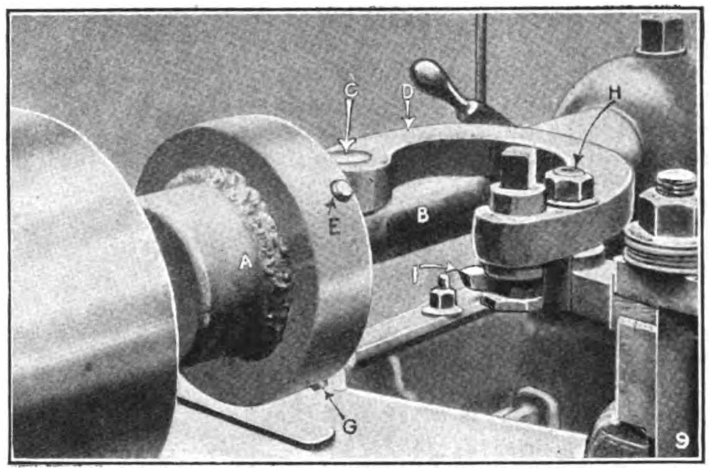
A device for turning spherical joints on the steam pipes of a Mallet locomotive is shown in Figs. 8 and 9. Fig. 8 shows the device, together with a finished joint, in the operating position in the lathe; in Fig. 9 it is shown in position, either for commencing the set-up or for removal after the operation has been completed. The pipe is held at one end in an ordinary four-jawed lathe chuck and supported at the outer end by the bushing *A* and the bar *B*, the latter being held in the tailstock of the lathe. In operation the bushing *A* is located within the steam pipe so that the pivot *C* of the swinging lever *D* is in the center of the partial sphere to be turned, and is then held by turning out four screws, two of which can be seen at *E* and *G*. These screws pass through a flange in the bushing so that their heads can be readily reached from the inner wall of the flange. The swinging lever is again pivoted at *H* to a bar held in the toolpost of the lathe. Underneath the extreme end of the swinging lever is the cutting tool *I*, so mounted that it is at the proper height and with provision for revolving it horizontally. When properly set the point of this tool must be directly opposite the center of the pivot *C*, in a direction at a right-angle to the axis of the pipe, and this when at the same radius as that of the finished joint. The regular crossfeed mechanism is detached, allowing the toolblock to occupy any position determined by the angular position of the pivots in the swinging lever *D*. It will be readily seen that the tool, controlled and guided as shown, will describe a circular path when motion is given to it by the





FIGS. 6 AND 7. DEVICE FOR MILLING KEY SEATS





FIGS. 8 AND 9. DEVICE FOR TURNING SPHERICAL JOINTS ON STEAM PIPES

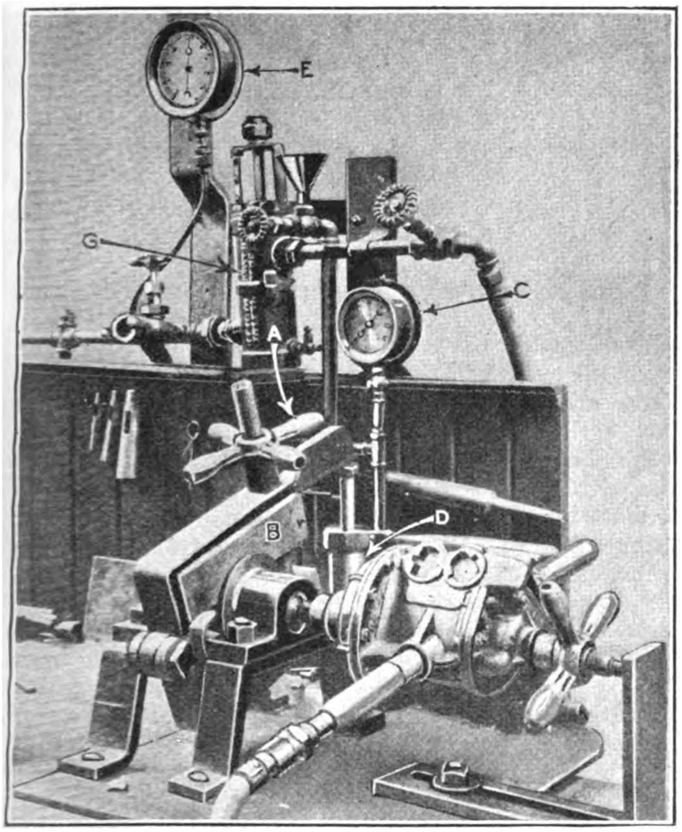


FIG. 10. TESTING A PNEUMATIC DRILL

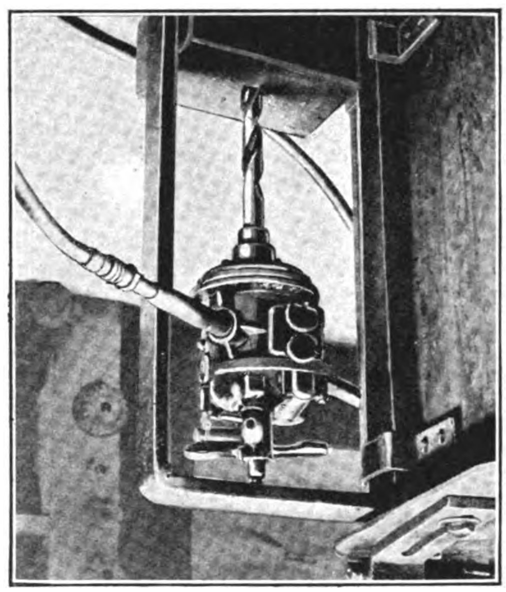
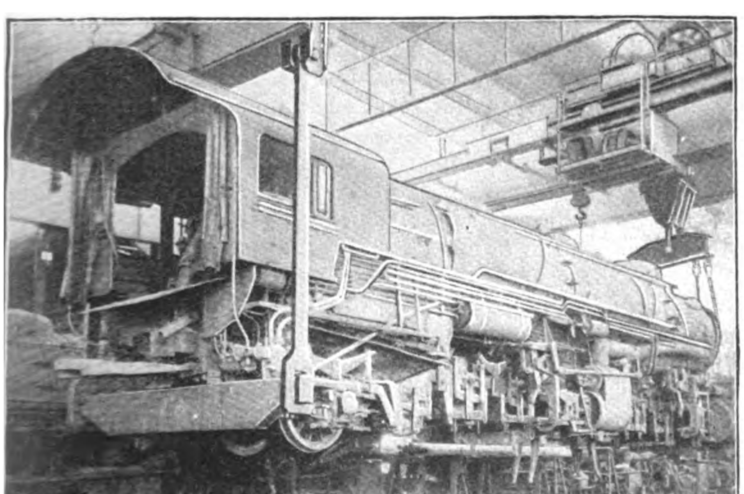


FIG. 11. THE PROOF OF THE TEST

longitudinal feed of the lathe. The swinging lever is curved so that it will not interfere with any part of the work during the operation.

Tests of pneumatic drills are regularly made to determine their efficiency as compared with records taken from new drills, and the testing apparatus is shown in Fig. 10. Pressure equal to that put on the drill in



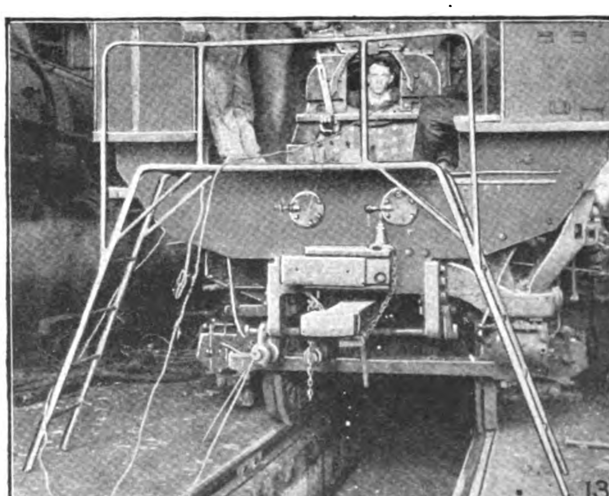


FIG. 12. TRANSFERRING A MALLET COMPOUND. FIG. 13. A CONVENIENT STEP LADDER

regular operation is obtained by a screw operated by the pilot wheel *A*. The power delivered is weighed by the small prony brake *B*, and indicated on the gage *C*, to which the pressure is transmitted through oil, compressed by the turning action of the brake in the cylinder *D*. The air pressure on the line is shown by the gage *E*, while the tool-o-meter *G* registers the amount of air consumed.

By a comparison of these readings with those recorded from tests of drills in good condition the relative efficiency of the drill under test can be determined. As a further proof, the consumption of air is taken with the drill in actual operation, the drill being mounted as shown in Fig. 11. With such means for testing the drills it is a very easy matter to tell when they need overhauling.

Transferring a Mallet locomotive from one track to another requires the service of two cranes, as shown in Fig. 12, and the operators must work well together if the transfer is to be accomplished without accident.

The deck of an engine under repairs is neither easy of access from the shop floor, nor is it a safe place to work without some protection at the rear. In Fig. 13 is shown a portable ladder for use at the rear end of an engine. As can be seen, access to the deck can be had from both sides and the platform at the top forms an extension to the deck. In addition the railing at the rear of the platform prevents the shopmen at work from accidentally stepping off into space.

Turning Vitrified Abrasive Wheels with a Steel Tool

By A. Lambercier
Geneva, Switzerland

On pages 53, 140 and 210 of American Machinist, there appeared an article on the manufacture and use of diamond tools that was of interest to me, especially as I had just concluded an experiment in the boring of large abrasive wheels by means of steel tools.

In our machine shop where we do many kinds of special jobs, we not infrequently have occasion to enlarge the hole or modify the shape or face of hard, vitrified wheels and when much material has to be removed we have experienced difficulty with the ordinary form of diamond tool held in a steel holder.

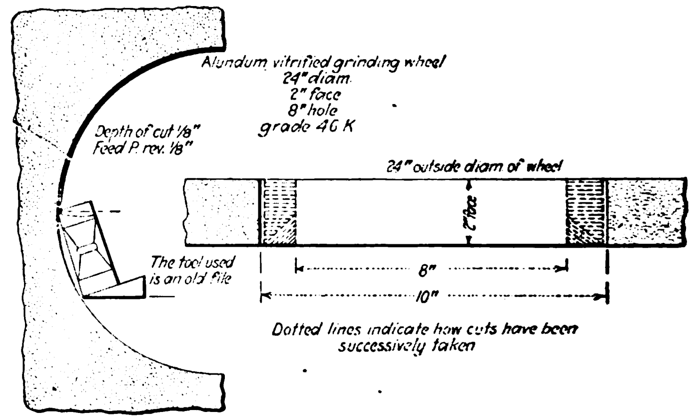
We had never given serious thought to the possibilities of accomplishing the result in some other way until we were confronted with the problem of enlarging the bore of eight 24 x 2-in. alundum wheels from 8 in. to 10 in. in diameter. This job was made necessary by immediate need for the wheels and the impossibility of securing quickly from the factory (alundum wheels are made in America and we are in Switzerland) wheels of the right bore of 10 inches.

We had in stock a sufficient quantity of the wheels that were right in every respect but the size of the hole and our job was, therefore, to remove approximately 57 cu.in. of alundum abrasive, grain 46, grade K, from each of the eight wheels.

The first wheel was mounted by means of four wooden jaws upon a large oaken faceplate and the boring started with the best diamond tool we had; but by the time the hole had been enlarged 1½ in. in diameter this tool was worn out, and a second tool lasted only just long enough to finish the first wheel. At this rate the job might have consumed perhaps two dozen diamonds.

It was at this stage that the idea came to me of the possibility of actually "turning" or "boring" out the excess stock by means of a steel tool. With the foreman I went to the scrap box where we selected an old Swiss file about 12 in. long. Breaking the tip by striking the file sharply across an anvil so as to secure a perfectly sharp edge, we ground it on the tool grinder to an angle something like a lathe tool, to give the necessary clearance.

This tool was clamped in the toolpost of the lathe and the work of boring started by pulling on the belt, as the slowest power-driven speed of which the lathe was capable was far too fast. I soon discovered that this



TURNING VITRIFIED WHEELS WITH STEEL TOOLS

tool worked as well as a bortz diamond and that the deeper the cut taken the better it worked.

The corner of the hole was taken off upon a 45-deg. bevel until the outer diameter of the bevel reached 10 in. Then the cuts were taken radially as shown in the sketch, about ⅛ in. depth of cut and ⅛ in. feed, until the diameter of the hole was within 1/16 in. of size; then a single cut was taken from front to rear, finishing the hole.

As soon as the possibility of success was apparent a power drive was applied to the lathe by mounting a 6-in. pulley in the lathe in the next row and belting from it to the largest step on the cone of the lathe in which the work was being done. By using the back gears of both lathes we were able to get a rotative speed of four turns in five minutes, corresponding to a cutting speed of about 25 in. per minute.

On the first cuts great care was taken for fear that the pressure might cause the tool to "dig" and break-out pieces of the material, but this did not happen. At the speed and feed mentioned there was no apparent wear upon the tool, but the slightest increase of rotative speed above this point resulted in immediate disaster to the cutting edge.

From this experiment I should say that, given a sufficient depth of material to be removed, there is no longer need for diamond tools for turning or boring vitrified wheels. A cut of less than 1/32 in. would simply wear out the tool of hardened steel; and here, probably, the diamond remains the only possible working tool.

Under the best of conditions it would probably be the limit of elasticity of the steel that governed the depth of cut and rate of feed, but within its limits the steel tool is to be preferred to the diamond for several reasons.

The time of boring the first wheel by this method was about four hours "floor to floor," and it was done at one grinding of the tool.

Allowing for Gage Wear

Shall Master Gages Have a Fixed Tolerance or Shall Allowance Be Made for Wear? American and British Points of View at Variance

BY R. DUMAS AND E. C. PECK

INTERCHANGEABLE manufacture is so closely tied up with the question of gages and tolerances that a thorough understanding of the subject is necessary to avoid confusion and to secure economical manufacture. One of the troublesome problems is that of the

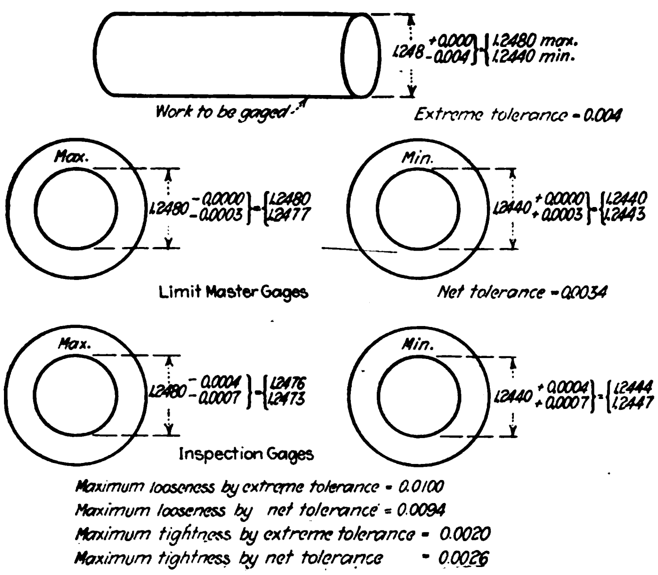


ILLUSTRATION OF RELATION BETWEEN DIMENSIONS OF WORK AND GAGES

wear of gages and the way in which this wear affects the work to be gaged.

There are two diametrically opposed points of view as to gage wear, one which we may perhaps call the American viewpoint since its general acceptance grew out of the war experience of the U. S. Army Ordnance Department, is "that the component dimensions as represented by master gages must never, from any cause, be exceeded either from wear of gages or inaccuracy."

The British Method of Gaging

The other view, held and practiced by the British War Office, allowed a tolerance for wear of the master gage and made a second set of tolerances to cover this. The two practices compared, in the following letters, are from R. Dumas, works manager of the British Thomson-Houston Co., and E. C. Peck, general superintendent of the Cleveland Twist Drill Co. It must be remembered that the latter was a Lieutenant-Colonel in the Ordnance Department in complete charge of gages and, that in this capacity, he put the department on a sound manufacturing basis so far as munitions were concerned. Mr. Dumas considers the American practice, as taken up by the American Society of Mechanical Engineers, unsound and states his case as follows:

"If manufacturer *B* contracts to make certain parts, such as plugs, for customer *A* to certain prescribed limits, customer *A* is not entitled to reject any parts which come up to the extreme limits mentioned. Customer *A* is entitled to gage the parts in order to see whether manufacturer *B* has complied with the requirements.

"If he is doing this with a limit gage, then it is clear that the 'go on' end of the gage must not reject any work which is up to the extreme limit, and as gages in themselves must have a tolerance it is clear from this that the gage tolerance must be on the plus side. If the gage tolerance were inside the limits, then it might easily result in parts being rejected which complied with the initial requirements, and manufacturer *B* would then have legitimate cause for complaint.

"It will be seen then that the legal aspect of the case determines the question, and it can be said with certainty that the extended experience obtained, when working on this basis during the war and since, has demonstrated that no practical objection to it exists.

"It is, in point of fact, a convenience, as it is so desirable as to be practically necessary to arrange for a slight difference to exist between work and inspection gages, in order to insure that work passed by the 'work' gages will run no illegitimate risk of being rejected by inspection gages."

Mr. Peck replies: "I am entirely familiar with the system carried out by the English in their munitions works during the war.

"When I took hold of the gage business in Washington, I found about half of the people trying to adhere to the English doctrine and the other half bitterly opposed to it. I made quite an extensive study of the practical use of it before coming to a decision as to what our own practice would be from then on. In my estimation, it was their practice of having a plus tolerance on inspection gages which caused the most of their trouble.

"The first thing I laid down for our observance in the Army was *that the component dimensions as represented by master gages must never from any cause whatever be exceeded either from wear of gages or inaccuracy.* This fundamental is conceded, by those who know the subject, to be so sound that it is rarely questioned. The old timers, generally those who think they adhere to a tolerance but do not, favor the practice used by England during the war.

"This subject was very extensively gone into by the Screw Thread Commission on its visit to England, and we spent an entire day discussing it. Every one at the conference table except one man from the Woolwich Arsenal, conceded the superiority of our method and also the economy in both production and gages.

"Proof of my statement that the system which I advocate works out is that immediately following its understanding and adoption, gage troubles became less and less until finally they were practically nothing. Under the English system they never got any less and there was always a constant quibble over how much over a mark a gage could wear.

"The following example will, I think, make this perfectly clear: The accompanying illustration represents the method I advocate. Either snap or ring gages can

be used and a check or plug made to master gage dimension will check the inspection gage against wearing beyond the limits. Where the inspection gage rejected work on account of 0.0004 in. (a very small amount) and the producer objected, the work was reinspected with an inspection gage worn to master gage size. However, this was rare, and most manufacturers preferred to work farther away from the danger line.

"The English, in a lot of their work, put on a second set of tolerances equal to wear limit of the inspection gages and began their inspection gage at master gage size and then made a second master, say 0.0004 in. large, and allowed the inspection gage to wear to this limit. This, of course, always violates the fundamental that component limits must not be exceeded. In fact, it sets up limits and then destroys them."

Instructions to Workmen

By C. J. Morrison

There are two extremes in giving instructions to workmen and they are about equally bad. In one method no detailed instructions are given while in the other specific directions are given for each detail of an operation. The first method denies the workmen help from those who are in a position to make a careful study of operations and leaves him to guess at cutting speeds and devices which may be used; while the second method kills initiative and confines the thinking to those who issue the instructions.

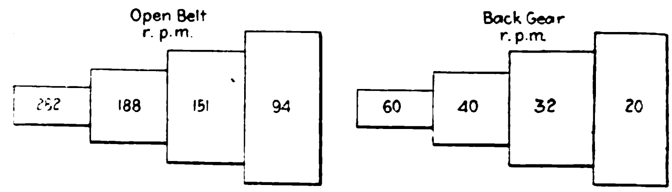
The operator on a vertical boring mill was handed detailed instructions covering the turning, boring and facing of an iron casting; he religiously followed the instructions so that each piece was completed in the estimated time of ninety minutes. The man who had made the schedule was delighted and the operator had nothing to say, but when the superintendent came along, trouble started. He demanded of the operator, "Are you trying to take as long as possible on that work? Don't you know that you can turn and bore at the same time?" To which the laconic reply was given: "Yes, I know it, but the instructions don't want it done that way." An explosion followed and ended with orders to "forget the instructions." The castings were then machined in sixty minutes each.

DRAWING NO.	PART NO.	
OPERATION	MACH. NO.	
	P.A.	O.A.
TIME		
SPECIAL TOOLS		
JIGS		
FIXTURES		
REMARKS		
	DATE	

FIG. 1. TIME CARD

A means that has been very successful is to give all the information that may be needed as a guide, but to put no limit on thinking or individual effort. Cards as shown in Fig. 1 were used and a card was given out with each job ticket. The entries except "Time" need no explanation except it might be well to state that symbols were used for the operations and that under "Remarks" any useful suggestions or necessary cautions were entered.

The time was divided into two parts, the "P.A." being preparation allowance or time necessary to get the machine ready to begin work and to restore it to normal condition after completing a job, while the "O.A." was the operating allowance or time necessary to perform the necessary operations on each piece. Naturally the P.A. would be allowed only once while the O.A. would be given as many times as the number of pieces called for on the job ticket and the total time would be the P.A. plus the O.A. for all the pieces.



DIAM. IN INCHES	CUTTING SPEED FT. PER MIN.				CUTTING SPEED FT. PER MIN.			
1	74	49	40	24	16	10	8	5
2	148	99	79	49	31	21	17	10
3	221	148	112	74	47	31	25	16
4	295	197	158	98	63	42	34	21
5		246	198	123	79	52	42	26
6		295	237	148	94	63	50	31
7			277	172	109	73	59	37
8			316	197	126	84	67	42
9				221	141	94	75	47
10				246	157	105	84	52
11				271	173	115	92	58
12				295	189	126	101	63
13					204	136	109	68
14					220	147	117	73
15					236	157	126	79
16					251	168	134	84
17					267	178	142	89
18					286	188	151	94
19					298	199	159	99
20					314	209	168	105

FIG. 2. SPEEDS OF A BELT-DRIVEN LATHE

As a further guide each machine was provided with a card showing the possible cutting speeds. Fig. 2 shows the card for a typical belt-driven lathe and incidentally shows the limitations of such a machine. In the case of a crank shaper the maximum speed attained for each combination of stroke and shaft speed is shown, but no explanation seems necessary for the speeds used in the cases of other machines.

Beyond the information described, the men were allowed to work out their own salvation and were generally able to do so, but, of course, there were cases where the prescribed time would not be made and there would be a request to see the detail sheet, which meant the sheet upon which the time estimate had been made and which naturally showed all the details such as number of cuts, speed, feed, etc. Usually a reading of the detail sheet solved the problem, but sometimes not, and then a request would be made for a demonstration. In such a case one of the demonstrators (men selected on account of their skill) would take the detail sheet and perform the operations just as laid out, and would usually succeed in equaling or beating the estimated time. Of course there were cases where the time could not be made, due to a variety of causes such as hard castings, defective tools, machine failure, etc., or a mistake in the estimate. In all such cases the difficulty would be remedied and when hard castings were encountered the extra time required for machining was charged against the foundry and soon eliminated hard castings.

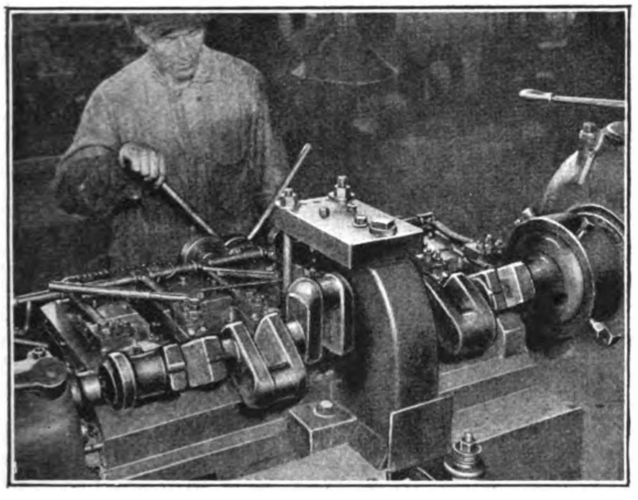
How Franklin Made Rolls-Royce Airplane Motor Crankshafts

Crankpins and Bearings Drilled to Reduce Weight—Finish Boring Two Crankshafts at Once—Special Fixtures for Milling and Other Operations

By FRED H. COLVIN
Editor, *American Machinist*

THE methods used by the Franklin Motor Car Co. in making crankshafts for the Rolls-Royce airplane motors are interesting as showing the removal of a large amount of stock and the machining of a thoroughly high-grade crankshaft. After the preliminary straightening, the insides of the crank cheeks were laid out to insure their cleaning up. The center bearing was then spotted for the steadyrest and the main bearings rough-turned in the Lo-Swing lathe as shown in Fig. 1.

The crankshaft was driven by a ball chuck which gripped the rough-turned flange at the end. The seven bearings were rough-turned at one setting, each with its own broad-faced tool. All the toolblocks were operated at once from one pilot wheel by means of the chain shown.



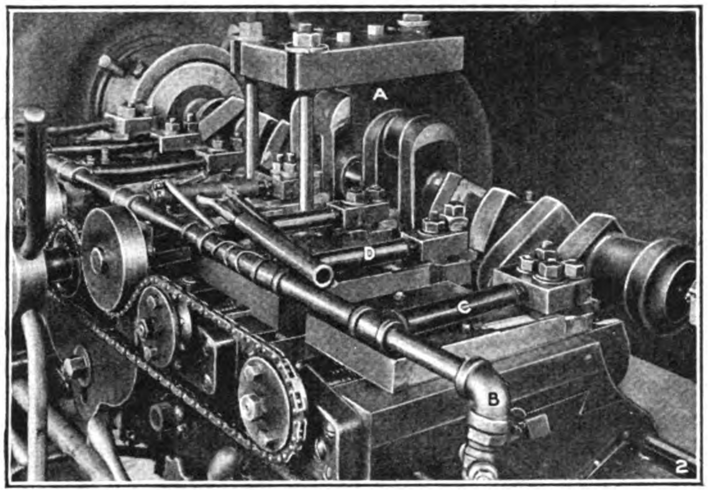
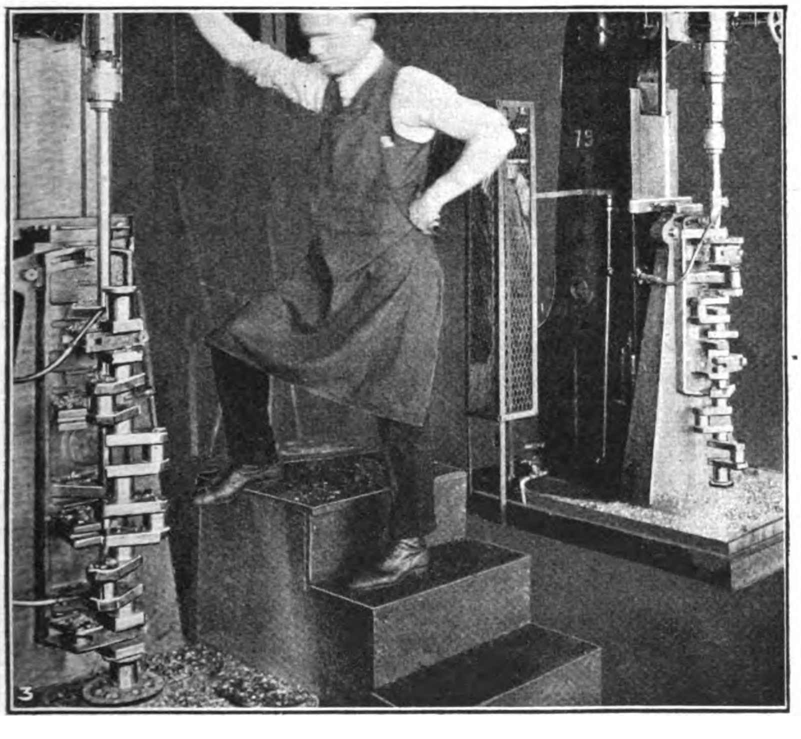


FIG. 1. ROUGH-TURNING ON LO-SWING LATHE. FIG. 2. FRONT VIEW OF SAME MACHINE



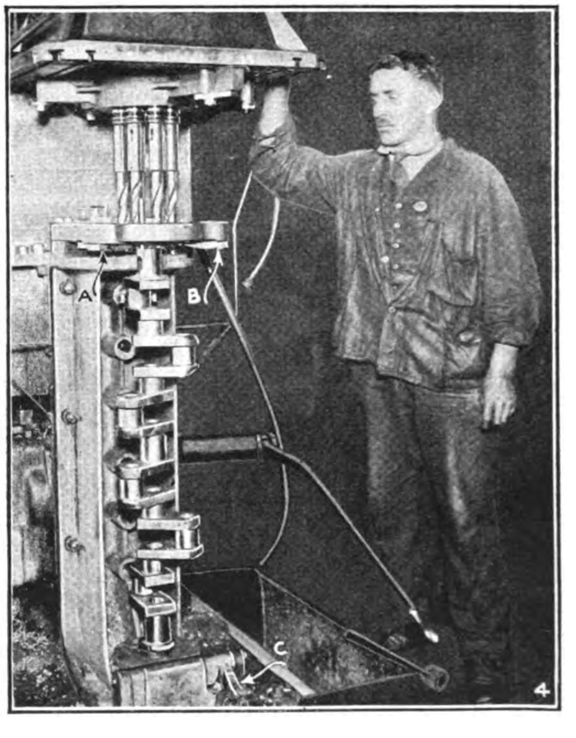
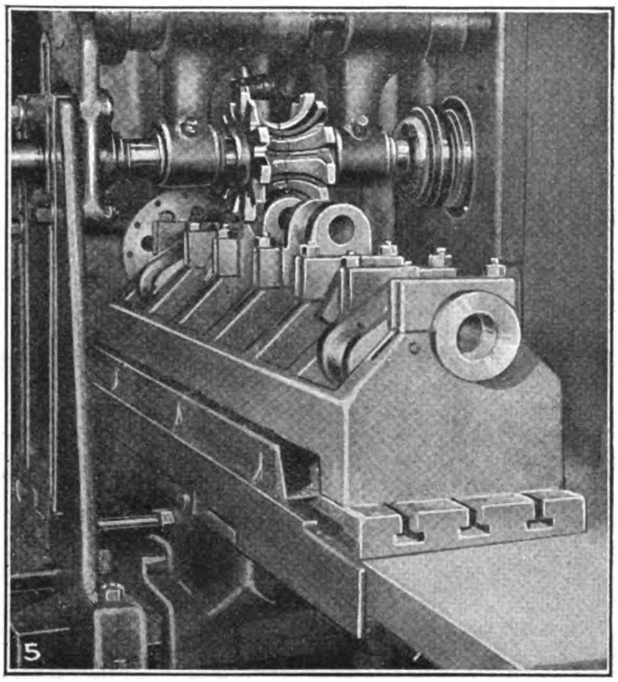


FIG. 3. DRILLING FOR LIGHTNESS. FIG. 4. DRILLING FLANGE HOLES



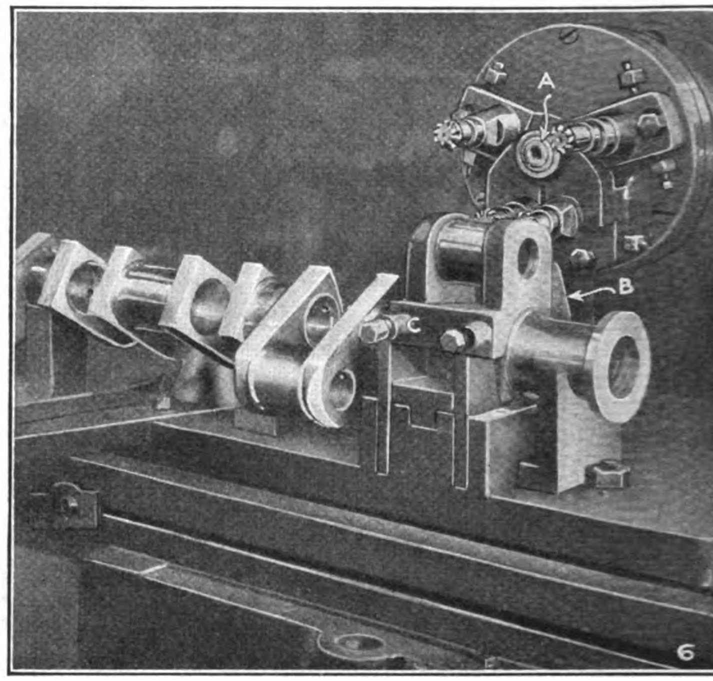


FIG. 5. MILLING ENDS OF CRANKS. FIG. 6. MILLING THE CORNERS OF CHEEKS

Another view of this set-up is shown in Fig. 2. The substantial steadyrest is shown at *A*. The tools were kept flooded with lubricant from the main pipe *B*, the hose connections *C*, *D*, etc., carrying it direct to each tool. This view also shows the chain which moves the different toolblocks into their work.

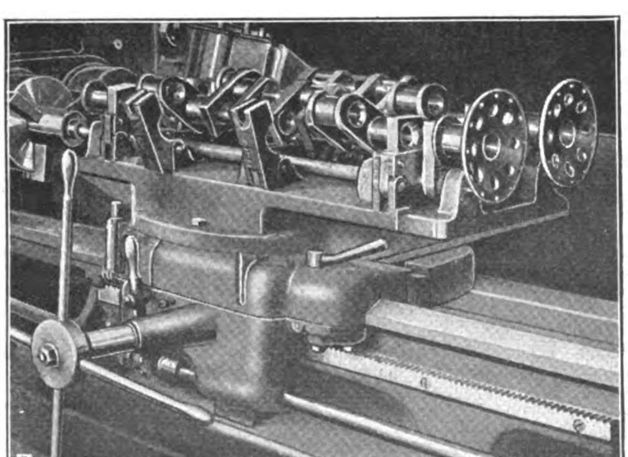
After the rest of the bearings were turned and the outside of the crank cheeks milled, both the crankpins and the main bearings were drilled for lightness. The rough drilling of both is shown in Fig. 3. The machine at the left is drilling the crankpins and the one at the right the main bearings. This view also shows the construction of the drilling fixtures, the method of clamping and adjustment for alignment. The use of wooden steps to enable the operator to easily see just what he is doing, may find uses in other operations.

The drilling of the lightening holes in the flange was done under a multiple drilling machine, as in Fig. 4. The flange was carefully centered by the clamping jaws shown at *A* and *B*, the thrust of the drills being taken by the step at the bottom. The step can be released by the treadle shown at *C*.

The rounded ends of the cranks were milled in the rigid fixture in Fig. 5. The shaft was clamped at every main bearing, swinging bolts being used for quick handling. Two cranks were milled at each setting, the illustration showing the two center cranks in position under the cutter. A noticeable feature is the chip guards at each side of the fixture. These guards are perforated at the bottom so that the oil or other cutting lubricant can drain off, leaving comparatively dry chips to be taken away.

A more unusual and consequently more interesting milling operation is shown in Fig. 6. Here the knee-type milling machine has a special fixture with four small auxiliary milling spindles bolted to the face of the column. These four spindles are driven from a central gear, but all four can be swung around a central stud *A*, and in this way are adjustable for position by the setscrews shown. This arrangement allows them to be positioned exactly as desired, so as to mill just the right round corner on the crank cheeks.

The two lower cutters set close together mill the inside and the two upper cutters the outside corners. The work is fed vertically past the cutters. The method of supporting the crankshaft and clamping can be seen



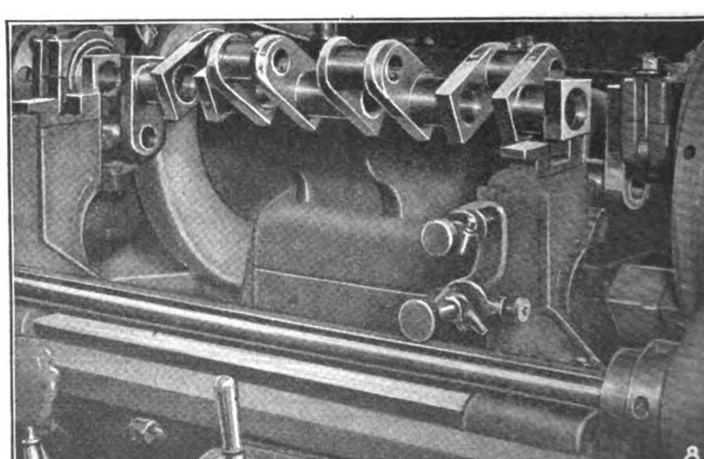


FIG. 7. FINISH BORING THE CRANKSHAFT. FIG. 8. GRINDING THE CRANKSHAFT

by noting one of the blocks *B* and the clamp *C*. The supporting blocks are enough narrower than the cheeks to allow the cutter to pass without interference.

For finish boring the holes in the crankshaft, so as to insure uniformity and aid in securing proper balance, a special fixture was designed for the double spindle Jones & Lamson flat-turret lathe as shown in Fig. 7. This fixture handles two crankshafts at once, cutting the actual machining time in half and hardly doubling the time required for handling. As shown the crankpins are being bored, Nos. 1 and 6 being in position for the boring bar. The method of clamping is clearly shown. The holes through the main bearings can be finish-bored in the same fixtures.

All the bearings are finished by grinding, as shown in Fig. 9. The special driving heads at each end have suitable indexes and are counterweighted to secure balance. As both heads are driven all danger of torsional stresses are avoided.

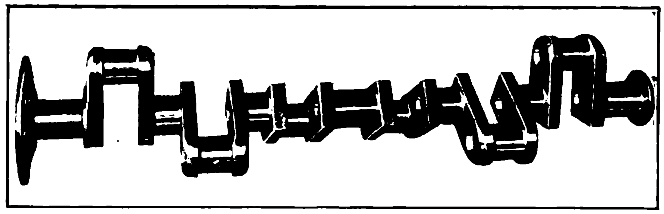


FIG. 9. THE FINISHED CRANKSHAFT

The finished shaft is illustrated in Fig. 9. It is finished all over and the hollow main bearings and crankpins make it very light for a crankshaft of its size. The motor has twelve cylinders and develops about 30 hp. per cylinder.

A Comparative Production Chart

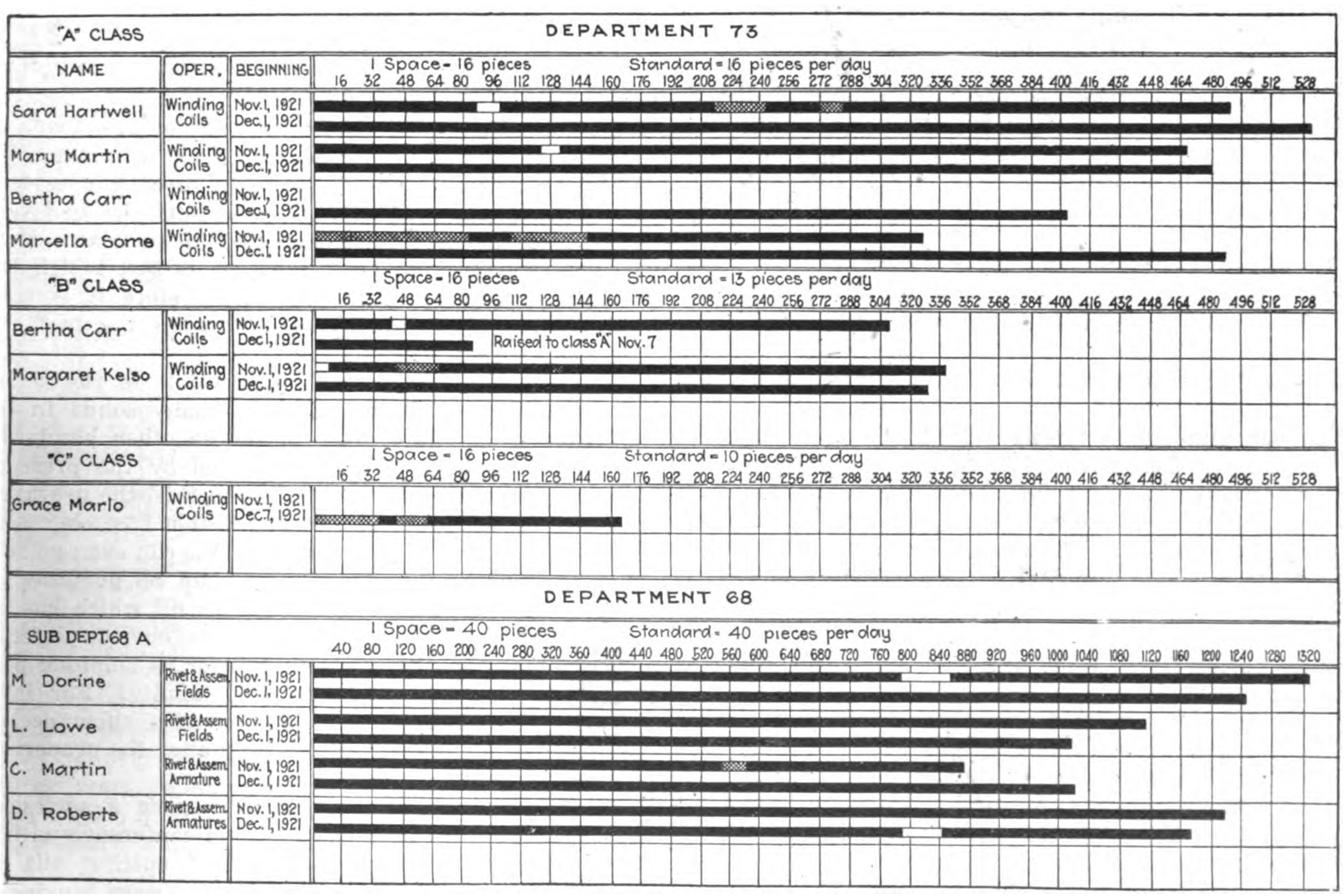
By Roy Booth

The most straightforward, comprehensive and readable comparative production chart I have ever seen is the one in operation at the Brantford, Ontario, plant of the Robbins & Myers Co. It gives at a glance the rating of each worker.

The chart is divided into sections, each section representing so many pieces of work produced. The standard of each operation is given. Producing that standard or above, that number of pieces is marked in black on the chart. Failing to make standard gives the man a red patch (cross hatched in the illustration) on the chart. If he is absent, an average of his past two weeks' work is taken and the required number of pieces is left blank. If this absentee allowance were not made, a wrong impression of a worker's ability would be shown.

We divide the girls into three classes, with three different rates of pay and three different standards to maintain. A girl in class C (the lowest) must produce, say, ten pieces of her work per day. If, for a week, she goes beyond her standard and produces that of B class (thirteen pieces), she is raised to that class with that standard to produce and a higher rate of pay. Producing sixteen pieces (A-class standard) for a week raises her to that class.

When advancements are to be made, the chart again shows its usefulness. The fastest worker does not always make the best foreman, it is true, but to hold a responsible position over others a man must be reliable, dependable, and a leader of men by example.



COMPARATIVE PRODUCTION CHART

Cutting Fluids

Why Adhesion Is an Important Lubrication Factor—Relative Physical Properties Found by Tests—The Best Oil for Each Operation and Material

BY EUGENE C. BINGHAM
Chemist, Bureau of Standards

IT IS a curious fact that so many of the very common operations of our ordinary life are without adequate explanation. A case in point is the use of soap as a cleansing agent. It used to be said that the hydrolysis of the soap produced an alkali which saponified the grease, but this explanation is not in accord with the known fact that soaps act very well as detergents, even when the grease is one not capable of being saponified, for example, a paraffin oil; to state that the soap emulsifies the grease is strictly in accord with the facts, but it in no wise explains the phenomenon—it merely describes it. So again, the use of lard oil or other liquid in various cutting operations in the machine shop is universally recognized as beneficial; but there is general disagreement as to the cause of the improvement which is brought about. Cutting oils are used partly on account of their cooling value, partly on account of their value as lubricants. But the value of an oil as a cutting lubricant is not measured by any known test.

It has been observed that the greatest wear of a tool in cutting operations is often not at the point of the tool, but on its face at some distance back from the point. This is a striking and very significant fact, and is proof of the very great friction between the chip and the face of the tool at some distance back from the point. The chip often adheres to the tool so firmly that a "bead" of metal appears to be "welded" to the face of the tool so that it is necessary to remove it forcibly. It has therefore been suggested that the cutting fluid acts primarily as a lubricant. Since the lubricant reduces the friction, the heat which otherwise would have been developed is avoided. If the lubricant also removes heat by conduction, so much the better.

Advantages of Adhesion

In examining the properties of the oils which might account for the marked superiority of the fixed oils, we find that lard oil has a lower temperature coefficient of viscosity than any of the common mineral oils. Lard oil therefore possesses an advantage over a mineral oil in that, although it is relatively fluid at ordinary temperature, it does not lose its viscosity rapidly at high temperatures. This explanation is good as far as it goes, but unfortunately it is not sufficient. There is a property which is entirely adequate to account for the differences noted, although it has not been sufficiently recognized in the past. It is the property of *adhesion*. That oil which adheres to the metal most strongly will most quickly form a film and most stubbornly resist all efforts to rupture it.

In lubrication it is of paramount importance to keep the surfaces from coming into contact, for wherever the solid surfaces touch adhesion will occur. The problem of lubrication is theoretically one of great simplicity. The two metals are prevented from seizure by means of a third substance which may be a solid such as graphite or talc, a liquid such as lard oil, or even a gas such as air. If the third substance is a solid, it must be soft so that it will readily undergo plastic flow. If it is a liquid, it must adhere strongly and it must not be too fluid, lest it squeeze out.

•Abstract of technical paper No. 204, Bureau of Standards.

The cutting of metals offers the most severe conditions for lubrication. The tool is continually taking

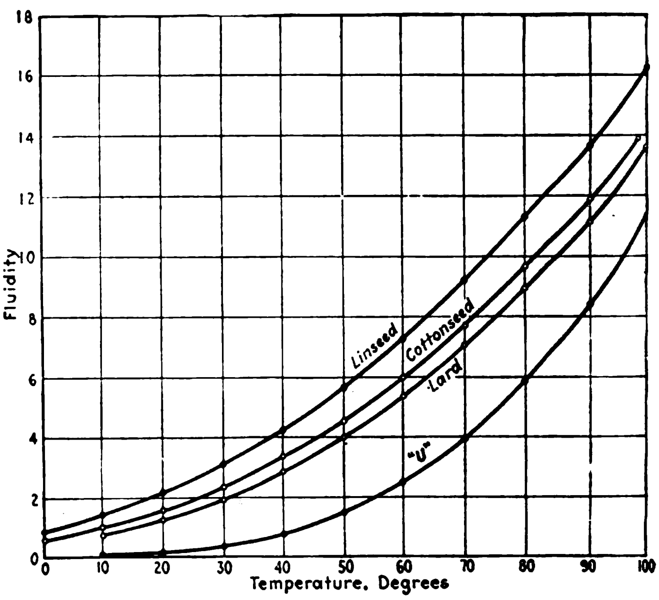


FIG. 1. FLUIDITY AND TEMPERATURE CURVES OF MINERAL AND FIXED OILS

off fresh metal, often at a high rate of speed and at high temperature. The pressure of the chip upon the tool is sometimes excessive. All of these causes tend to make adhesion between the chip and the tool very great and the need for a lubricant to prevent seizure may be imperative. That lubricant is best which has the greatest adhesion for the metal, since it is most strongly drawn into the space between the tool and the metal being removed.

But adhesion is extremely susceptible to the action of impurities. Oils will not wet many solids in the presence of a dilute alkali. On the other hand, the adhesion of oils is greatly increased by the presence of an acid in solution. According to this, the prevalent practice of excluding as far as possible free oleic acid from a cutting oil is shortsighted. We can even go further and predict that for many, if not all purposes, it may yet be possible to synthesize an oil which has all of the virtues of lard oil without its obvious defects. Thus sulphur in the free condition or as sulphide possesses a great amount of residual affinity. For it is to be noticed that small quantities of a substance of high adhesive qualities will entirely alter the properties of an inferior oil.

To test this further the author made a series of experiments. In correspondence and conference with a large number of practical users of cutting oils in quantity, it was found that some users were convinced

that regardless of cost, or convenience, certain oils sold under trade names were indeed superior to even the best lard oil. Some of the best oils, according to general consensus of opinion, contain sulphur in large quantity.

In the study of cutting oils in particular and the question of lubrication in general, it seems necessary to determine the different properties of fixed and mineral oils which may possibly produce the effects upon their value as lubricants, which we have been discussing.

Each of the fixed oils here tested has a considerably higher specific heat than does the single mineral oil, which may probably be taken as typical. Even at that the highest specific heat is a little less than one-half that of water. The fluidities of the two fixed oils are generally greater than the fluidities of the mineral oil at the same temperature as shown in Fig. 1. The characteristic feature, however, is that the increase of the fluidity with the temperature is so much greater with the mineral oil. The contrast between the two classes of oils is brought out much more clearly in Fig. 2, when we plot the fluidities against the specific volumes. The viscosities in centipoises are plotted in Fig. 3. Only a small portion of the curve for the mineral oil can be shown on the plot. Although the specific heat and the slower change of fluidity with the temperature are both in favor of the fixed oils, we have tried to show that the adhesion is probably the main reason for the superiority of the fixed oils as *lubricants.*

G. Q. Lewis of the U. S. Navy Yard at Washington has made an elaborate study of the cutting properties of fixed oils, compounded oils, and trade preparations. He employed for the tests the actual machines and materials which are to be used in practice. He has found several trade preparations to be superior to even lard oil in boring chrome nickel steel propeller shafts

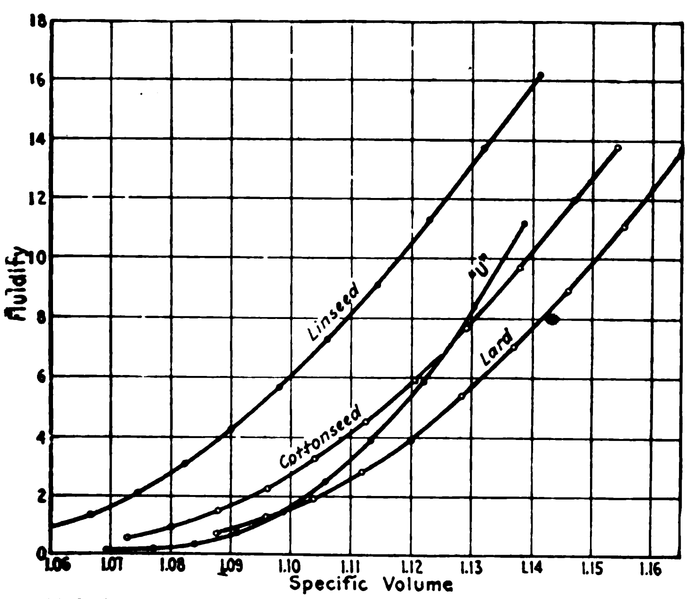


FIG. 2. FLUIDITY AND SPECIFIC VOLUME CURVES OF MINERAL AND FIXED OILS

with an elastic limit of 100,000 lb. per square inch. He has secured an increase of production of 50 to 100 per cent over the earlier practice, where a mixture of 10 per cent rapeseed oil and 90 per cent paraffin oil was used. A saving of 13 per cent in the cost of the oil was also obtained.

A graphical comparison of different oils so diluted with paraffin oil that each of the mixtures would cost 35c. per gallon is given in Fig. 4. The machine was run by its own motor which was connected with an ammeter and voltmeter, and was run at a rate of 120 r.p.m. with a feed cut of 8 in. per hour on chrome nickel steel. The watts and the temperature of the oil were measured and were plotted against the elapsed time. With lard oil or pure mineral oil the tool would break down at once. With two of the mixtures tested, Nos. 13 and 18, the tool worked steadily without any balk whatever. With the other mixtures the machine balked and had to be started over again, as can be seen by the sharp maxima appearing in the curves. Mixture No. 13 is the one which had been found in the earlier tests to give such superior results.

The author desired to test this oil on other operations. For this purpose a number of samples of oil were made up. A few of these were:

(1) The preparation which had given best results at Navy Yard.

(2) Lard oil.

(3) A mixture of 90 per cent of paraffin oil and 10 per cent of oleic acid. The oleic acid had been heated with sulphur.

(4) Pine oil, sulphur and turpentine.

These samples were placed in plain bottles with numbers only, sufficient dye and pyridine being added to the lard oil to disguise it. They were then given to a skilled mechanician to be used in threading wrought iron. The resulting threads were examined with a microscope by several independent observers. There was general agreement that the lard oil gave the best results and the new preparation, No. 1, the worst results. The results fell in the order, Nos. 2, 4, 3, 1. They were very decisive for this particular operation. Pure mineral oil was, of course, inferior to all of these.

It appears likely that lard oil is better than anything which has been devised for certain operations. The prediction seems to be amply justified that oils with high residual affinity, such as those containing oleic acid, or pine oil with sulphur, will be found best. But it is noted that the trade preparation No. 1 also contained several per cent of sulphur.

The purpose of a cutting fluid is to cool the work; to lubricate, thereby increasing the speed of production; to lessen the wear of the tool; to diminish the energy consumption; to insure a good finish and accurate dimensions; to wash away the chips; and occasionally to prevent the formation of metallic dust. There are two ways in which the use of a cutting fluid assists in getting accurate measurements: The work may be unduly heated and thereby expanded unless a good cutting oil is employed; the "finish" obtained by such an oil is often essential.

Cooling is said to increase the cutting speed on wrought iron and steel from 30 to 40 per cent and on cast iron from 16 to 20 per cent. It is to be noted that the most effective cooling is obtained by directing the cooling fluid on the shaving at the point where it is being formed, because thereby, through cooling, the plastic flow of the material is lessened as well as the tendency of the shaving to seize on the tool. At the same time the fluid can be drawn in readily between the shaving and the tool, as the pressure fluctuates, and act as a lubricant.

Washing away the chips is quite important in such operations as deep drilling. Securing a strong, continuous shaving is an advantage in such work and it is

necessary to have a lubricant with sufficient adhesion. The stronger the force of the stream of cutting liquid the better it will carry away the chips, as well as cool and lubricate the parts.

If the material is tough, a lubricant is necessary, but

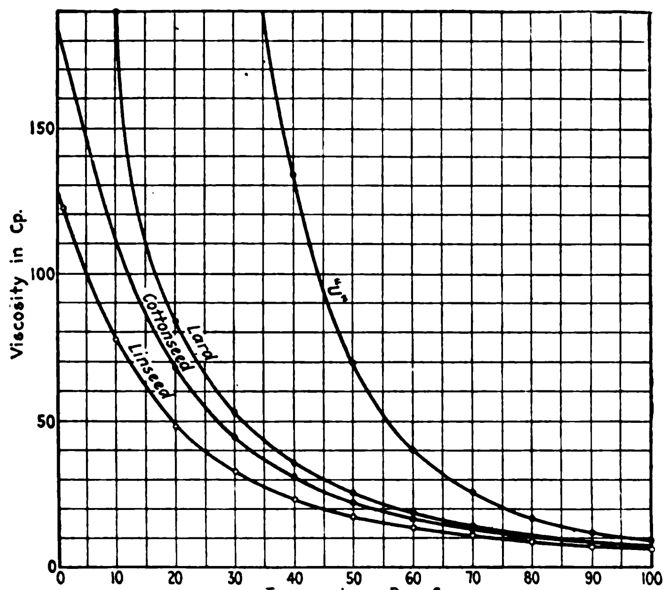


FIG. 3. VISCOSITY AND TEMPERATURE CURVES OF MINERAL AND FIXED OILS

if brittle, it may be dispensed with. The lubricant used in a given case will naturally depend upon the finish desired and the tolerances allowed. For roughing operations on a given material a cheap lubricant may suffice, whereas for fine operations on the same material, such as in the manufacture of micrometer screws, the best grade of lubricant is demanded regardless of price. There is the further fact that with some machines such as turret lathes and automatics, the cutting fluid and the oil used to lubricate the machine are liable to intermingle, and a cutting liquid must be used which will also serve to lubricate the machine.

The substances used as cutting fluids are oils, air, aqueous solutions, and emulsions. We may subdivide the oils used into fixed oils, mineral oils, and compounded oils, and the fixed oils may again be subdivided into animal oils, fish oils, and vegetable oils. Under animal oils we have the several varieties of lard oil, No. 2, No. 1, extra No. 1, and winter strained prime, tallow oil, neat's-foot oil, sperm oil, wool fat, horse oil, and whale oil. Lard oil is the cutting oil *par excellence.* It is used on the most difficult work such as cutting delicate threads, tapping and cutting gears, deep hole drilling in steel. It is not suitable for cutting very hard steel and glass, or where the heat production is excessive. Small amounts of free acid present in the oil are probably beneficial and they do not cause corrosion of brass parts. In the great majority of cases substitutes for lard oil can be used to advantage.

The very high cost of the fixed oils as a class makes it desirable that the purchaser make suitable tests to determine that the material is both unadulterated and sanitary. Not only should the free acid be not too high, but the stearin should be kept as low as possible. Sperm oil is practically interchangeable with lard oil as a cutting oil. Several users report fish oils satisfactory but the odor was so objectionable that their use was abandoned. Fish oils, however, can be deodorized. Under vegetable oils, olive oil, rapeseed oil, mustard-seed oil, castor oil, peanut oil, soya-bean oil, cocoanut oil, cottonseed oil, corn oil, and linseed oil have been more or less extensively used. Under the heading of vegetable oils we may also include creosote oil, turpentine oil, turpentine, pine oil, and rosin oil, although they are distillates and therefore are not "fixed oils."

The mineral oils are naturally cheaper than the fixed oils. In fluidity they range from kerosene, which is used in cutting brass and aluminum, to heavy engine oils. They prevent rusting and are very stable, so that corrosion, carbonization, and gumming are small factors. They are not cheap enough to compete with emulsions on the one hand; and on the other hand, because they do not have sufficient adhesion to those steels which are difficult to work with emulsions, their use is not very satisfactory.

Compounded oils are the natural result of the desire to secure the adhesion of the fixed oils combined with the stability and cheapness of the mineral oil. Some of the compounded oils contain considerable amounts of lard oil, while others contain none at all. It should be observed that "cutting compounds," which are very satisfactory to many large users, apparently contain no fixed oil whatever. Thus there is possible a great saving in fats by a knowledge of the best usage in regard to cutting oils. It appears probable that the necessary adhesion can be gained by thoroughly incorporating sulphur in oils, such as red oil (oleic acid) and pine oil, which themselves have considerable adhesion.

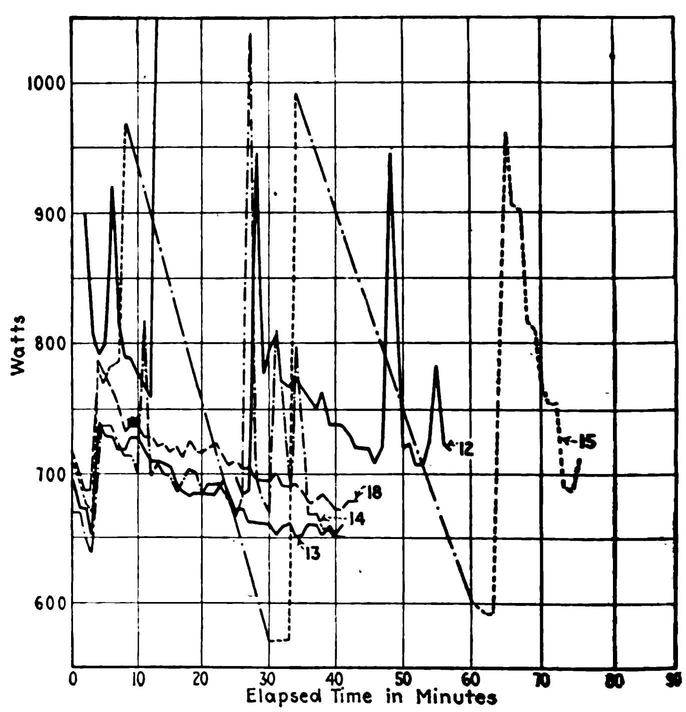


FIG. 4. FLUCTUATIONS IN POWER CONSUMPTION WITH VARIOUS LUBRICATION OILS

Air can not be considered as a lubricant for the purposes which we are here discussing, and it has very little cooling effect. However, with a brittle metal like cast iron it is used successfully to take away the chips. Water alone has been found satisfactory in some cases, as in the drilling of ship plates and boiler plates. Water does not generally give a smooth finish, nevertheless it

is sometimes used to give a bright, smooth surface to steel, which is called a "water-cut" surface. It may also be used on brass and aluminum, but water is in disfavor, owing to the fact, noted by every machinist, that it rusts the machines and the work as well if this is either iron or steel. To prevent rusting, an alkali may be added to water.

Ingredients of Emulsions

There are three types of material used for making emulsions: One is made from mineral oil compounded with a neutralized sulphonated oil. The second type of soluble oil is made from a mineral oil compounded with an alcoholic solution of soap. The third variant is marketed as paste made of a thick soap solution and mineral oil. These are known as cutting pastes or compounds. Of the three forms the last is the least desirable, and the second is perhaps the most so, as it may be made without expensive apparatus and requires much less technical skill to fabricate. Emulsions give trouble on automatics or machines with turret heads because the emulsion gets under the turret and displaces the lubricant.

Gum arabic and starch are sometimes added to cutting oils, presumably in order to increase the stability of the emulsion. The tendency of the oil to give trouble by gumming, and the fire hazard as well, can be reduced by diluting it with mineral oil. The objection to the fixed oil on account of expense does not apply to the distilled oils of vegetable origin.

The character of the operations performed, the shape and adjustment of the tool, the speed, feed, and depth of cut have more to do with the choice of a cutting fluid than the character of the steel. For drilling, an emulsion is most commonly used, but for light, slow work a compounded oil, or even lard oil, is resorted to. For rough drilling, water containing a little soda, soap, or borax is employed. For reaming, an emulsion is generally used, although the work is often done dry. For a high polish and for extremely heavy work, compounded oil or lard oil is resorted to. For milling, emulsions are almost universally used, with alkaline solutions, compounded oils, and lard oil as variants. Planing is often done dry. In many cases, however, an alkaline solution or a dilute emulsion is used.

In tapping and threading, emulsions are used in a large minority of instances. Lard oil and compounded oils are resorted to generally. Turning practice in different shops and for different operations shows the widest variance. Some workmen turn dry, others with alkaline solutions, emulsions, compounded oils, corn oil and—where a high finish is desired—lard oil and turpentine. On automatic screw-cutting machines and machines with a turret head it is best to use a compounded oil with as small a proportion of fixed oil as will serve the desired ends.

Recollections of an Old-Time Mechanic

By John J. Grant

Looking back on more than fifty years of my active life in the machine shops of America, with many ups and downs, I thought some of my experiences would be worth reading by men and boys in the same walk of life today.

I was born in Leicester, England, on March 22, 1844, and came to America in 1848. They tell me I came of a mechanical family; it must have been mechanical as it could not have been a financial one, for I have never heard of a rich Grant.

On arriving in America the school ma'ams commenced the arduous task of my education, or rather tried to cram book knowledge into my head, and from the various thrashings I can remember having received, it must have been an uphill job.

If there was any tinkering in the little old red school house, at the parting of the roads, where I got what book knowledge I received, I was the one to do it. Early in the game I was given up as a bad job in the literary line. I am sure of this as I was graduated without a diploma tied with blue ribbons, and was placed at work in a woolen mill at an early age, working only thirteen hours a day.

I can now look back with some amusement at an attempt I made, at the early age of eleven or twelve years, to revolutionize the manufacture of woolen cloth. My old father let my inventive ability have full scope if I did not neglect my work. Only once can I remember his getting out of patience with me, that was when I attempted to take off the electricity from the finishing cards caused by the rub rolls, and not being an Edison not only failed, but came near smashing things generally, including myself.

My father took me by the ear and said that there was altogether too much mechanic in me and that I had better attend to my work.

My first job in a machine shop was cutting, straightening, flattening and punching lead wire used for weights in jacquard looms, and a prouder boy never lived. Of course, I had several fights with the other boys because I felt my oats; one of these fights was with Christie Baush, father of the Baush boys of boring mill fame.

I got a little inside knowledge in machine work by helping the engineer who did the general machine work around the factory. I had never seen a steam engine to remember it and the mechanical germs having commenced to work, I sought knowledge of steam engineering of the engineer, with but little success, for he had never learned the trade and knew nothing about the construction of a steam engine; but he was sure that there was a cylinder, piston and flywheel and that the piston went back and forth. So with that knowledge I started in to make an engine, which at that time was the height of every boy's ambition who was mechanically inclined.

I succeeded after many failures, one of which was to get rid of the steam in the cylinder caused by there being no way for it to escape, as the D-valve had no exhaust chamber on the cylinder exhaust ports. But one day I discovered the trouble, made the necessary changes and the next time I tried to start the engine I had no trouble and it seemed to me that it must have made two million revolutions per minute, as I remember now after these many years.

Of course, nearly every one in the small village came to see my engine and from that day I was a second Watt—and all the other celebrated mechanics that any of the villagers had ever heard of.

Foundry Work on Motor Cylinders

Cores for Use in Molding Machines—Construction of Core Racks and Method of Handling—How Core-Sections Are Assembled

SPECIAL CORRESPONDENCE

THE operations described in this article are those of machine-molding motor cylinders which, of course, are water jacketed. The cores consist of a long hollow cylindrical core for the bore and two thin core shells for the water jacket. The main or central core has a liberal over-all length for hanging up at each end in the mold so that a neck at one end of this main core receives the two half shells for the water jacket, the shells being pasted to the neck and

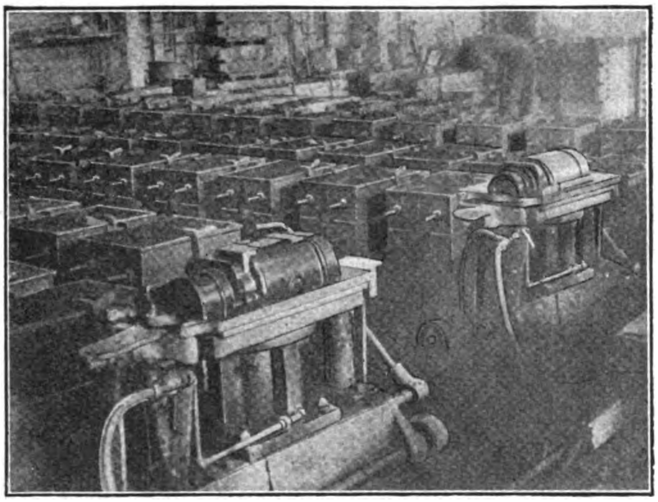


FIG. 1. MOLDING MACHINES WITH CORES SET

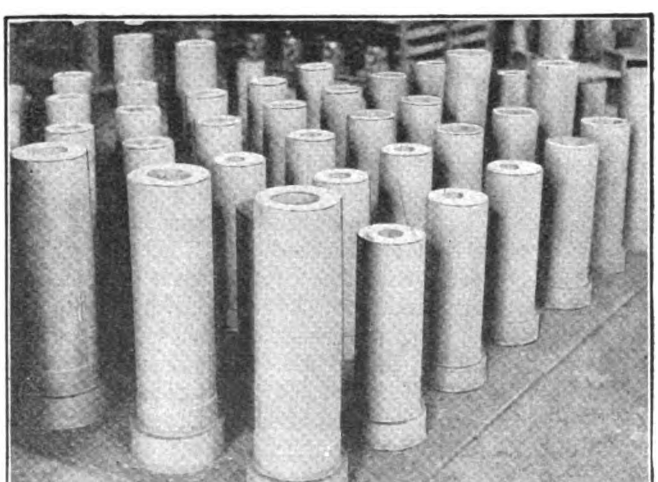


FIG. 2. CENTRAL CORES FOR CYLINDERS

wired together over wedges until set in place. A view in the foundry showing two molding machines and a large number of molds set up at the rear will be seen in Fig. 1. The two molding machines are shown with the cylinder patterns for cope and drag in place. The flasks are two-part, of iron, with handy trunnions at the ends for handling.

A group of cylinder cores are shown in Fig. 2, and at the base of each will be noticed the collar for seating the water chamber cores which are made in the iron box, Fig. 3. This box is also shown in Fig. 4. The making of the half-shell cores for the water chamber is accomplished as in the two illustrations just referred to. As is customary in this section, the core

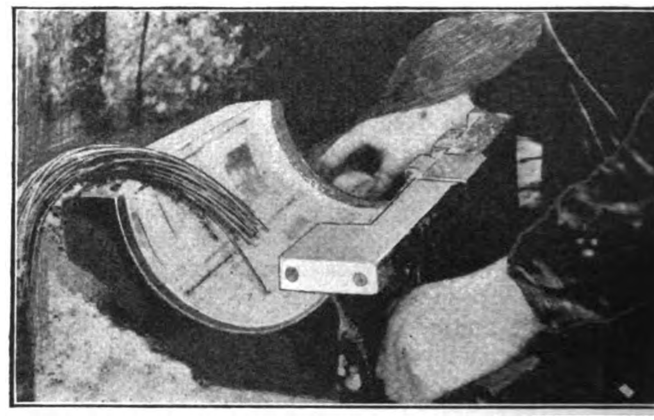


FIG. 3. MAKING CORES IN METAL BOX

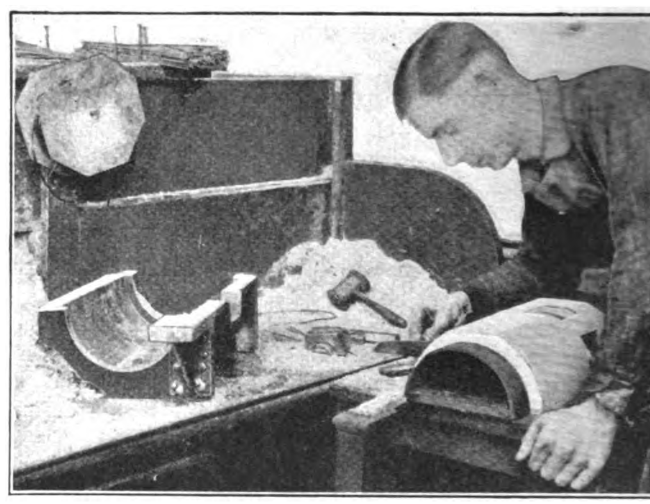


FIG. 4. CORE AFTER REVERSING BOX

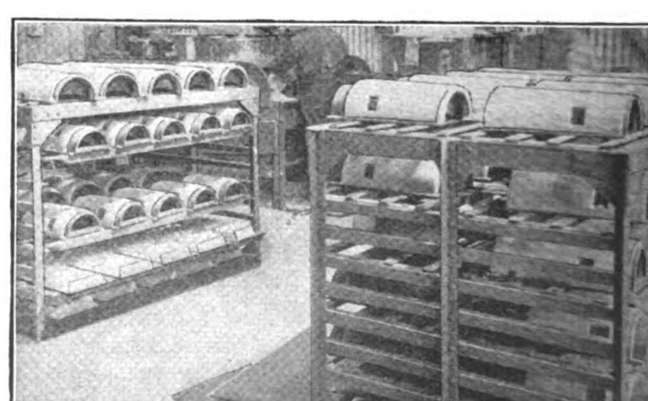


FIG. 5. CORE RACKS

work is made up of Monterey core sand. The shells are quite thin and light and are reinforced by bent annealed wire placed around the curve of the work

while similar wires are placed straight from end to end to reinforce the material longitudinally.

These reinforcing wires will be seen in Fig. 3. The core is formed up to shape in the metal box as shown and is then turned over with the upper or convex metal form, as shown in Fig. 4, for the touching up of the edges and preparing of the work for baking in the ovens.

The method of carrying the cores on racks is illustrated in Fig. 5. These racks are of light stiff angle sections with cleats for eight or more shelves or open trays upon which work of this character is readily and safely placed for handling in and out of ovens and around the foundry in general. The racks are picked up by an overhead crane sling consisting of a long notched bar from which two suspension hooks are swung to grasp the rack by the upper frame member, thus keeping it in a level position as it is carried back and forth.

The cores when assembled appear as in Fig. 6. The two water chamber half shells are placed around the neck of the central core, as indicated, and pasted in position while held by wires around the outside, being kept in proper relation to the central core by light wood wedges inserted some eight or more in number around the opening between the outer and inner cores. Afterward the wedges are removed and the cores are ready for placing in the molds, which have been formed from the patterns on the molding machines.

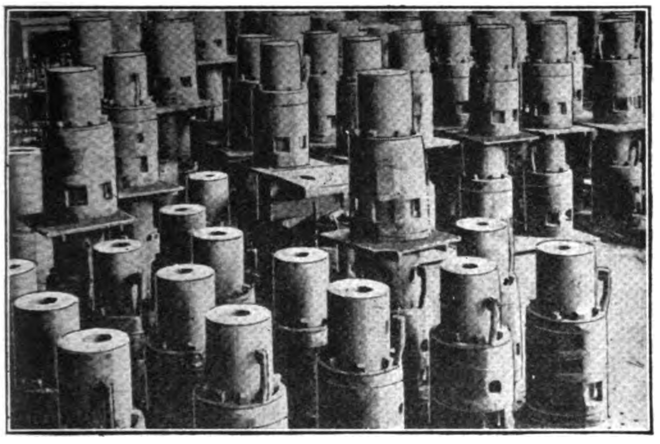


FIG. 6. ASSEMBLED CORES

The illustrations of this work are from the foundry of the Holt Manufacturing Co., Stockton, California.

No Seed, No Crop

By Robert Grimshaw

The best of all books tells us, what we should know without being told: "If ye sow not, neither shall ye reap." If the foreman is content to run along without implanting any useful ideas in the heads of his workers, without showing them how to better their work and their own condition, he must not expect his department to make a good showing.

Because the average foreman has waked up to the fact that he is a source of knowledge, skill and inspiration his workers and their products will surpass those of him who is content to be merely a messenger to convey the orders of the planning department.

If he sows seeds of discontent, he will reap a crop of disaster. If he sows no useful seeds, his crop will necessarily be meager and unsatisfactory.

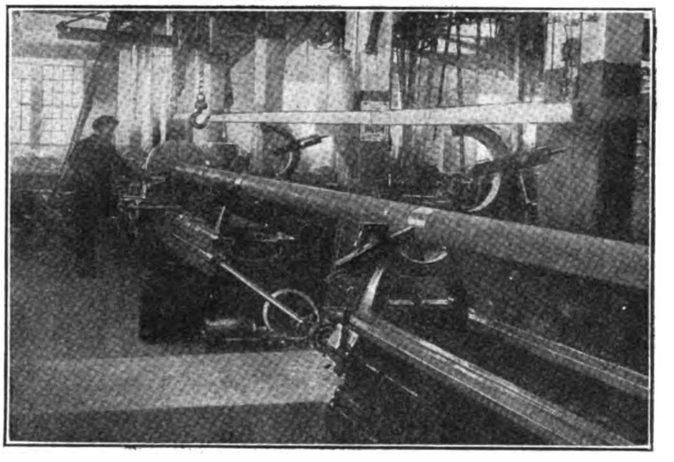
Re-Echoes from the Oil Country

By E. W. Tate

The writer well remembers the "Echoes from the Oil Country" that were published years ago in the *American Machinist*, but to him, as well as to most other readers of that journal, it never occurred to presume that oil might possibly be located in the State of Maine. Such, however, is the case, and a real oil well drilling apparatus is in operation in the central part of the state, a few miles south of the town of Dover. A shaft 600 ft. deep has been drilled, and every evidence of a real oil country, except the oil, is present.

The intention of the writer is not to exploit the possibilities of locating oil, but to illustrate a "Down East" Yankee method of repairing a well drill shank. The shank was 6 in. in diameter by 40 ft. long overall, and a lathe with the distance between centers to accommodate it was not to be found within 200 miles.

In order that the drilling operations should be suspended as short a time as possible, the job of re-threading the broken end was put up to the superintendent of the Fay & Scott shops, at Dexter, Maine. The longest lathe available in this shop was 24 ft. overall, but about 10 ft. away and practically in line with it, was a 16-ft. lathe of the same swing.



USING TWO LATHES TO HANDLE A LONG JOB

The manner in which the repair was made is shown in the accompanying photograph which, though it does not show the actual machining operation, indicates how the two lathes were coupled together to handle the job.

The tailstock of the shorter lathe and the headstock of the long one were removed, leaving a headstock on one and a tailstock on the other to provide the necessary centers. Both carriages were available for "spotting" the long shaft for the center-rests in which it was finally supported, and after this was done a second center rest was mounted on the 24-ft. lathe and the tailstock moved out of the way to permit the boring, turning and internal threading that was required.

For this work the positive movement of the lead screw of the partially dismantled lathe was, of course, necessary; and to accomplish this, two universal joints and a short length of shafting were used to join one lead screw to the other. With the proper change gears in place on the driving lathe, and an extension shipper rod to enable the operator to control its movements, the actual machining operation was performed with the carriage of the other lathe as readily as though a single lathe had been used.

Methods of Machine Tool Design

Further Continuation of the Fourth Part—Factors Affecting the Design of the Belt Shifting Mechanism—Peculiar Features of the Plate Planer

By A. L. DeLEEUW

ANY or all of these troubles may be met when an existing planer is speeded up or slowed down. Suppose the planer has been acting in a satisfactory manner and that we are speeding up, say 25 per cent. We will probably find that the over-run on the return stroke is excessive and that there is a great deal of squealing of the belt at the moment of reversal. The squealing is due to the fact that the unavoidable slippage between belt and pulley lasts over too long a period of time and the reason for this is, that the entire belt is on the pulley before the planer has come to a standstill. There are two reasons for this condition: In the first place, the speed of the table is greater, so that the belt is shifted at a more rapid rate; and in the second place, the momentum of the parts has been increased more than 50 per cent, so that not only should the belt not go on faster but, on the contrary, it should have gone on at a slower rate.

If, on the other hand, we slow down the same planer we may find that the machine refuses to reverse and, quite often, that the belt will fly off. The reason for this is that the belt comes on the pulley at a slower rate so that the planer has come to a standstill when only part of the belt is on its pulley. When this happens at the end of the cutting stroke we have the condition that a small momentum of the planer has been absorbed by friction in a relatively long time, so that no great assistance of the belt was required to bring the planer to a standstill. Now, however, this small fraction of the belt width must not only give the planer the momentum due to the higher return speed, but must also overcome the resistance of friction, which it may not be able to do.

This leads to the conclusion that every planer should have its shifting mechanism designed according to the conditions of cutting and return speed, and according to the maximum and minimum loads which may have to be moved. In all planers the load is rather uncertain. Fortunately the power required to create the energy of movement of table and load is a relatively small percentage of the total energy, so that quite wide variations of the load on the table do not have much effect on the shifting. On the other hand, a relatively small variation in the speed causes a quite perceptible variation in the energy required to bring the planer up to its speed.

Requirements of Shifting Mechanism

It was pointed out in a previous paragraph that planer belts should not run at less than 1,000 ft. per minute because they would not shift properly. It might seem that it would be possible to arrange the shifting mechanism in such a way that a small movement of the table will bring the belt on its pulley. It will be found, however, that if this is attempted one would merely succeed in making the belt eye turn or double the belt and that the upper part of the belt—that is, the portion which is running over the countershaft pulley—would not follow the movement of the shifter eye. As a result, the belt would tend to move back as soon as the shifter eye is no longer controlled by the dog of the table.

The conditions of shifting from cut to return are quite different from those when shifting from return to cut, on account of the difference in belt speeds and perhaps in pulley diameter. In order, then, to shift properly we should have an entirely independent shifting mechanism for cutting and return speeds. Such mechanism should be made adjustable so that when the speed is changed the shifter arrangement may be changed correspondingly. It is not practical to determine beforehand the exact conditions we will meet when running the planer. The friction is an uncertain amount and the total amount of momentum of the various parts is not easy to determine. It is therefore most likely that when the planer is run in we will find that the shifting mechanism does not act as we wish it. If means were provided to speed up or slow down the action of the shifter mechanism it would be a simple matter to adjust this mechanism so as to get the shifting as nearly perfect as possible. If a planer is built to run at one speed only, this adjustment might be locked, but if it is desired to run the planer at various speeds, then this adjustment should be made so that the operator can set his shifter mechanism for whatever speed he wishes to use.

An Important Consideration

The foregoing considerations are not of much value for small planers carrying light loads and running at moderate speeds; but when a planer becomes of large dimensions, carries heavy loads, and especially when it must run at high speed, it becomes very necessary to pay great attention to the requirements of shifting. As a matter of fact, the proper design of the shifting mechanism becomes then one of the main problems of the planer design.

In the fall of 1897 the United States Government asked for bids on a large number of machine tools specially adapted to the manufacture of armor plate. Among them were a number of planers, all of which were specified to have cutting speeds of 8, 16 and 24 ft. per minute. An analysis of the requirements of these planers along the lines shown in the previous paragraph convinced the writer that it was not possible to utilize the ordinary shifting mechanism commonly used on planers and that it would be necessary to have an independently driven mechanism do the shifting. This mechanism was to be adjustable for various speeds (though this feature was not of as much importance as some of the other features) and was to be started by a dog on the planer table. It will be noticed that the speed variation called for had a very wide range.

Similarly where a planer must be designed with a low cutting speed due to the hardness of the material to be cut, and a high return speed so as to bring the productive qualities of the planer up to the highest possible point, an analysis of the shifting conditions

should be carefully made and, if necessary, a shifting mechanism should be designed which will permit of proper belt shifting conditions.

As was pointed out, the main problem of a planer drive is to stop the momentum of the parts and start the momentum in the opposite direction. This problem becomes more difficult when cutting and return pulleys of the planer are of unequal sizes, because the smaller pulley is used for the return stroke which takes place at the higher speed, and we have the condition here that a belt working on a small pulley must give momentum to a large pulley. It was this momentum of the pulleys which for many years held the possible return speed of a planer down to a rather low limit. Various attempts were made to make a higher return speed possible.

The Doolittle Arrangement

One of these attempts was the Doolittle arrangement by which, at the beginning of the return stroke, a belt was placed on a rather large pulley, thus starting the return stroke at a comparatively low speed. Immediately after this speed had been attained the belt was shifted off this pulley and onto a small pulley which now had to increase the momentum of the parts an amount due to the difference between the previous low and the new high return speed. It was, of course, possible to put on as many sets of pulleys as might be required to bring the return speed up to the right point. Theoretically there was no limit to the return speed, but practical considerations will show that the gains made are not commensurate with the increased complexity of the mechanism. Besides, it was not possible to get the advantages of this arrangement on relatively short stroke.

In other arrangements aiming at higher return speeds springs were placed so that the table would butt up against them at the end of its stroke. This, of course, required an adjustable stop to butt against the springs. Part of the momentum was absorbed in the spring and given out again trying to start the table on its return stroke. Still other arrangements attached the rack to the table in such a way that a certain amount of movement was possible. This end movement of the rack would compress the spring. All these devices depending on springs were not practically successful. There was still the difficulty of giving a great deal of momentum to the planer in a very short time.

In 1906 the author introduced the aluminum driving pulleys on the planer. These have since been adopted by a number of planer manufacturers and have proved to be successful. Instead of finding some means to deliver a large amount of energy quickly to the planer, this method reduces the amount of energy which must be given. In a previous calculation it was shown that about 80 per cent of the energy of the moving parts of the planer was possessed by the rims of the driving pulleys. As aluminum has a specific gravity of only about one-third that of cast iron the "80" energy for cast-iron pulleys will be reduced to about 27, so that the total energy would be reduced from 100 to 47. We might expect, therefore, a possible return speed of about twice that of a cast-iron pulley. However, friction, etc., make this proportion considerably less. The Cincinnati Planer Co., which uses aluminum pulleys on its planers, states that in making a test on a 72-in. motor-driven planer it took 39 hp. at the point of reversal with cast-iron pulleys, while with aluminum pulleys only 30 hp. was required. In another test made on a planer with cast-iron pulleys the machine was capable of making 165 strokes in 30 minutes, while with aluminum pulleys the same machine made 189 strokes.

As a rule the greatest difficulties met in the design of a planer are caused by the fact that the return speed is much higher than the cutting speed, making it necessary to give momentum to a large pulley by the action of a belt on a small pulley. There is, however, another difficulty which shows up when the planer must be arranged for heavy cutting, and this difficulty is accentuated when the ratio between return and cutting speeds is high. To state the problem more definitely, if we must design a planer with a pull on the table rack of 30,000 lb., we have a difficult problem on our hands; but if, at the same time, the specifications state that the return speed must be $2\frac{1}{2}$ times the cutting speed, the difficulties of our problem have become greater. Suppose that we must provide for this table pull of 30,000 lb. and a cutting speed of 25 ft. per minute. Then we must give the table an amount of energy of $30{,}000 \times 25 = 750{,}000$ lb.-ft. per minute. In order to do so we will run the belt at a high speed—let us say 3,750 ft. per minute. The belt pull then must be $750{,}000 \div 3{,}750 = 200$ lb.; and if we are willing to admit a belt pull of 50 lb. to the inch, we can get along with a 4-in. belt. So far we have met no particular difficulty because we have neglected to consider the return speed. Allowing a ratio of 4 to 3 between cutting and return pulleys, the return belt would have to run at a speed of $\frac{3}{4} \times 2\frac{1}{2} \times 3{,}750$, which is a little over 7,000 ft. This is, of course, too high. If now we reduce this return belt speed to 3,750 ft., the cutting belt will have to be 8 in. wide, which is too wide for a shifting belt. This condition used to limit the return speed of heavy planers. In 1898 the author applied for the first time the double driving pulley to overcome this difficulty. In this arrangement, shown in Fig. 57, there are two driving belts, each on its loose pulley. Both belts can be shifted to a tight pulley so that, though shifting narrow belts, we obtain an amount of power as if we had used a wide belt. Such double driving pulleys are occasionally used for the return belt.

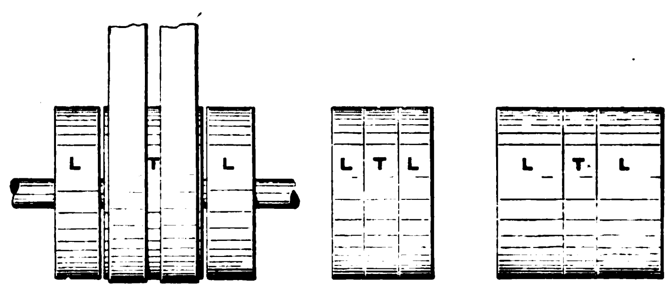


FIG.57 FIG.58 FIG.59

FIG. 57—PULLEY ARRANGEMENT WITH TWO DRIVING BELTS. FIG. 58—ORDINARY ARRANGEMENT OF PLATE PLANER PULLEYS. FIG. 59—PLATE PLANER PULLEYS ON WHICH BELTS CAN BE SHIFTED SIMULTANEOUSLY

There is a limit to the amount of pull obtainable and the ratio of return and cutting speeds even when double belts are used. Allowing the ratio of 4 to 3 as the greatest practical ratio between cutting and return pulleys, allowing 5,000 ft. per minute as the maximum rim speed of a pulley, 3,750 ft. maximum belt speed, and 50 lb. maximum pull per inch width of belt, we can

readily calculate the amount of pull we can give to the table for various ratios between cutting and return speed. We will assume that the maximum width of belt which can be shifted is 6 in. and that the ratio of return and cutting speed is $2\frac{1}{2}$. We will then find:

Speed of return belt—3,750 ft.; which makes speed of rim of cutting pulley 5,000 ft.

Speed of cutting belt—$\frac{4}{3} \times \frac{2}{5} \times 3{,}750 = 2{,}000$ ft.

Two cutting belts are used, each 6 in. wide.

Combined pull of cutting belts equals $2 \times 6 \times 50 =$ 600 lb.

Power on cutting stroke equals $2{,}000 \times 600 =$ 1,200,000 lb.-ft.

The actual available pull on the table will now depend on the cutting speed. If, for instance, the cutting speed were 30 ft., the maximum available pull would be 40,000 pounds.

If, on the other hand, we should have a planer in which the return speed equals the cutting speed we would find at once that we can run the cutting belt at 3,750 ft. and as we again use two belts, each 6 in. wide, we would have an available power of 2,500,000 lb.-ft. For any ratio between cutting and return speed the available power on the cut will lie between these two extremes—namely, 1,200,000 and 2,500,000 foot-pounds.

Various requirements of planers call for various arrangements of the belt drive. The simplest drive of

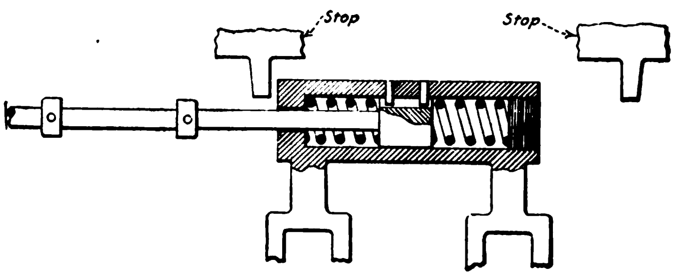


FIG. 60—SAFETY DEVICE BETWEEN ROD AND BELT SHIFTERS

all is that of the plate planer. This machine is generally arranged to have the tool work in either direction, so that cutting and return speeds are the same. In the ordinary planer the table is longer than the stroke so that it is possible to put the controlling dogs on the table itself. In the plate planer, however, a short carriage is used which carries the tool and not the work. This carriage is much shorter than the longest stroke of the planer and therefore cannot carry the dogs. Vaious arrangements are used to accomplish the shifting, all of which come down in principle to this: That a rod or bar is placed alongside of the bed, upon which collars can be adjusted, and these collars are struck by a projecting part of the carriage. The movement thus given to the rod is utilized for the shifting of the belt.

There are two possible arrangements of the pulleys: Either the one shown in Fig. 58 or that of Fig. 59. In the first case, the tight and loose pulleys have the same face and the belts are shifted in the same manner as on the regular planer; that is, one belt is shifted off the tight pulley before the other belt is moved on. In the second case, the loose pulleys have a face twice as wide as that of the tight pulley and the two belts are shifted simultaneously, as we did in some of the countershafts heretofore described. The first mode of shifting requires some device like that used on the regular planers which, by means of lever connections and a cam, shifts the two belts successively. The second arrangement does not call for any mechanism but permits the rod to pull the belt eyes direct. Fig. 60 shows a safety device between the rod and the belt shifters. If the momentum of the pulleys were not entirely taken up at the moment that the new belt has completely moved onto the tight pulley, then the carriage would go on and pull the belt eyes still further, which might cause trouble. To avoid this, the casting which carries the belt eyes is pulled up against a stop at either end, and if the carriage moves still further it merely pulls the rod which no longer moves the belt shifters, but merely compresses a loaded spring.

The Foreman's Place in Industry

C. E. JENSON

The foreman's place in industry is both peculiar and important, more so now than at any previous decade in industrial history. I say "decade" for two reasons —industrial history as such is so short that we cannot speak of this and that century in its development; and it is only about ten years since the problems, in the solution of which the foreman can so much aid, have assumed their present great importance.

This place in industry is both peculiar and important because industrial organization has somewhat changed, and we can no longer speak so definitely of "the foreman class." We have developed two distinct foremen's classes, or rather in retaining the old-time class we have developed a new one, calling for different attainments and having a different status.

But in either case, and in view of the increasing sharpness of the controversy—combat if you will—between so-called "capital" and so-called "labor," it is the foreman who can best serve the interests of both parties, by acting as interpreter and mediator, always with due regard to his position as member of one or the other of the two foremen's classes. Those classes I shall not define here more definitely than to say that the one holds the old place as in a military organization, in command of a particular squad, while the other has to do in a specified function with every employee in every squad where such function is usual.

The factors making up a foreman's success might be laid down as the possession of those qualities that make almost any leader successful: Knowledge of his own qualifications, of his defects, of the abilities and limitations of those with whom he comes in contact, of the activity in question, and of the ability to impart his knowledge and make himself obeyed.

But some things might be pointed out as the potent factors in a foreman's success. They may be worth cultivating if nature has not been generous in this connection at birth, and if opportunity and environment have failed to make amends for nature's neglect.

On broad general principles, the foreman is assumed to know more, even in petty details, than those under him. But if he cannot show this to the satisfaction of others he will be set down as wrong. Once his fallibility and ignorance are shown to exist and to be backed by his tacit or other declaration of infallibility, his influence for good, his strenuous seeking for progress in the work, his most earnest efforts for the betterment of his operatives' condition, are weakened, if not entirely destroyed.

Centerless Shoulder Grinding

Grinding Valve Stems, Spring Bolts and Other Similar Pieces—Feeding the Machine by Gravity—Some Production and Cost Figures

WESTERN CORRESPONDENCE

GREAT strides have been made in the last few years in the art of grinding shafts and similar work without the necessity of holding the work on centers. The same method is now being applied to "shoulder work."

At *A* in Fig. 1 are shown some of the spring bolts that are being ground on the Reeves roll grinding

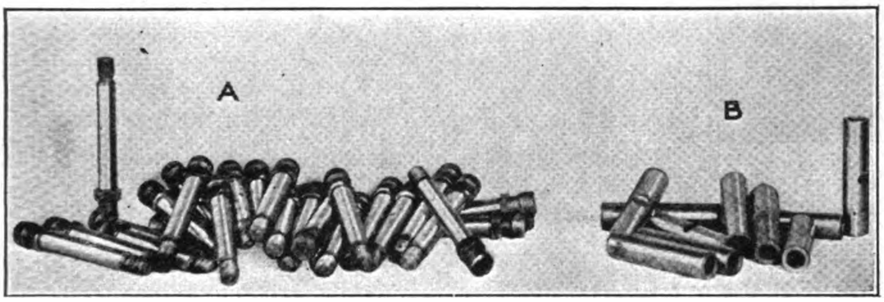


FIG. 1—SPRING BOLTS AND PISTON PINS GROUND IN THE CENTERLESS GRINDING MACHINE

machine, shown in Fig. 2. The piece is held in the workrest *A*, which is seen more plainly in the drawing, Fig. 3. The workrest is raised and lowered through a cam arrangement, operated by the handle *A*, Fig. 4. The workrest also slides in the groove in which it rests, and can be moved in and out by hand. Thus the operation of placing a piece in position consists of raising the workrest, pulling it out (toward the operator), inserting the piece, sliding the rest back to a stop, and lowering it into position as shown in Fig. 2. The work rotates between the side of the wheel *B* and the face of the wheel *C*.

Wheel *B* is a No. 120-W grade alundum wheel which, as grinding machine men know, is very hard. This wheel operates to hold the piece in place and to govern its speed of rotation rather than to grind it, as most of the grinding is done by the wheel *C*. The grade of wheel *C* is therefore governed by the work, a Grade M

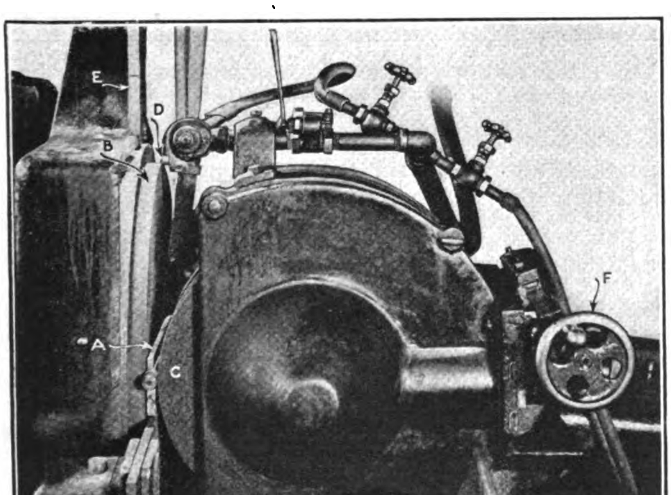


FIG. 2—SPRING BOLT IN POSITION FOR GRINDING

wheel being used in this instance. Wheel *B* is 18 in. in diameter and rotates at a speed of 18 r.p.m., giving a peripheral speed of approximately 85 ft. per minute. Wheel *C* revolves at a speed of 6,000 ft. per minute.

Another example of shoulder grinding on this type of machine is shown in Fig. 5. An intake valve for a twin Excelsior motorcycle engine can be seen protruding from the workrest of the machine. The workrest is not moved horizontally, as it is necessary only to raise it in order to change the pieces. From 0.010 to 0.015 in. of stock is removed in this operation, reducing the valve stem to a finished diameter of 0.310 in. The production is approximately 150 pieces per hour. The thickness of the workrest is approximately 0.300 in., as it is, of course, necessary that it be thinner than the thinnest piece to be ground, although this same rest is used for holding work of larger diameters.

One method of feeding straight work to a machine of this type is shown in Fig. 4, the material, in this instance, consisting of piston pins. A long trough is erected, as shown, and the pieces are fed to the wheel by their own weight. Due to the large amount of stock that was left on these pieces (approximately 0.020 in.), six cuts were required. They passed through the machine at the rate of 20 per minute for five cuts,

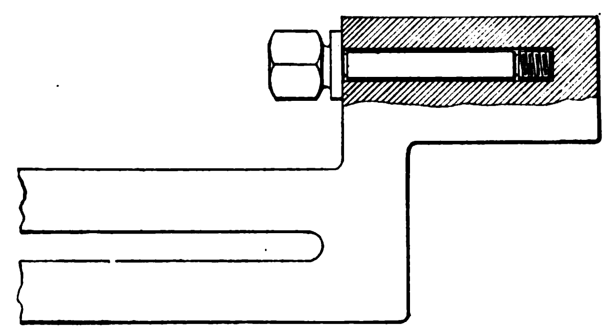


FIG. 3—WORKREST

then 10 per minute for one cut. If only 0.002 in. of stock had been left on the pins, two cuts only would have been required, according to the operator handling this job.

The operation illustrated in Fig. 6 is that of grinding the rear hub ball retaining cup represented in Fig. 7. These cups are put through the machine four times, removing 0.005 in. of stock each of the first three cuts, and 0.001 in. in the last, or finishing cut. The operator feeds the pieces to the wheel by means of the trough shown in the illustration, after which they are carried on by the action of the wheel and eventually fall into a trough and thence to a box as shown in Fig. 8. These pieces pass through the machine at the rate of 1,600 per hour at each cut, or a total of 400 finished

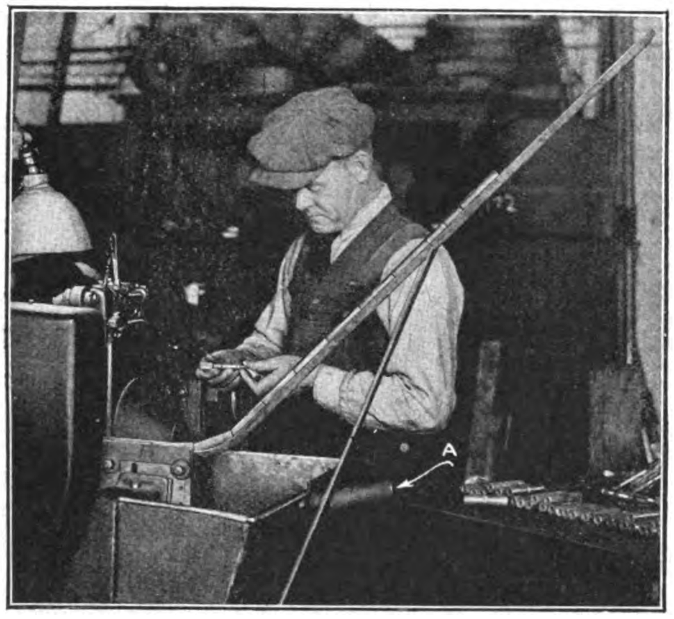


FIG. 4—GRAVITY CONVEYOR FOR PISTON PINS

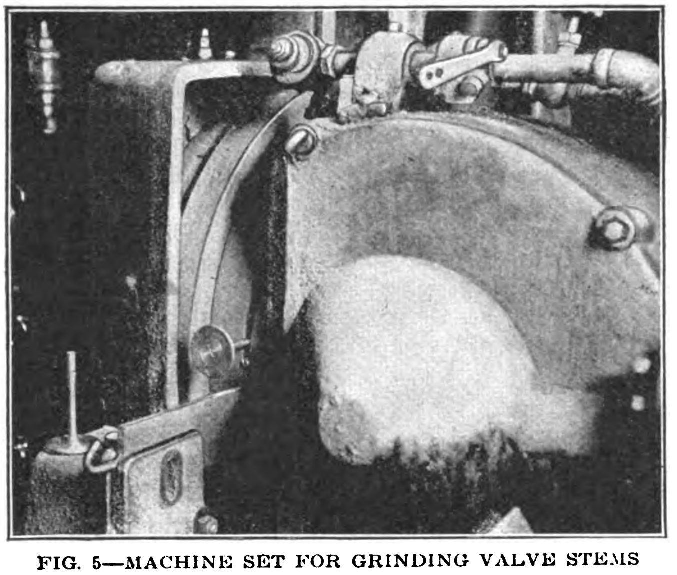


FIG. 5—MACHINE SET FOR GRINDING VALVE STEMS

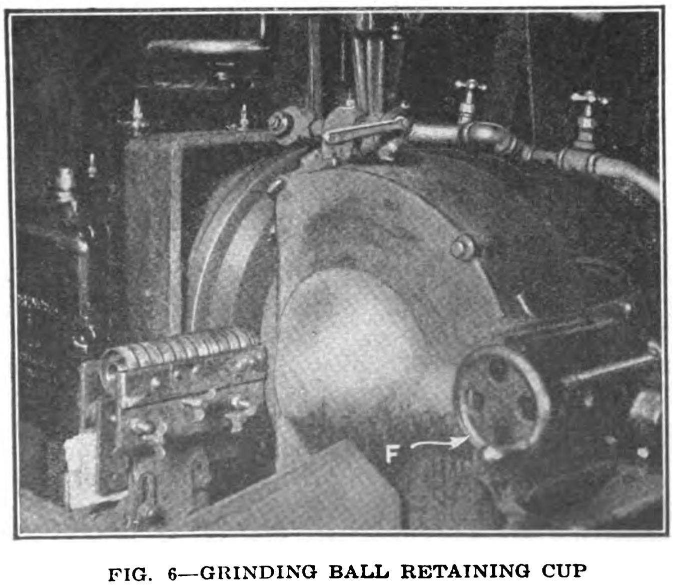


FIG. 6—GRINDING BALL RETAINING CUP

pieces per hour. The cost of this operation is $0.40 per hundred pieces.

The wheel *B*, Fig. 2, is dressed with a diamond that

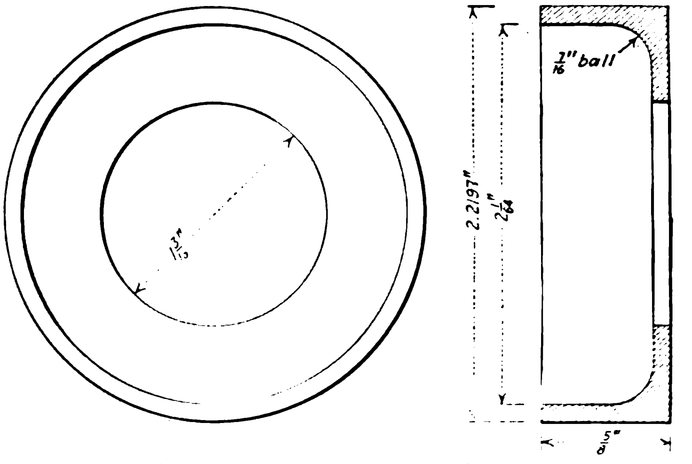


FIG. 7—BALL RETAINING CUP

is clamped into a holder which slides vertically on the gib *E*, and the wheel *C* is dressed by means of a diamond located in the back of the machine, where it is

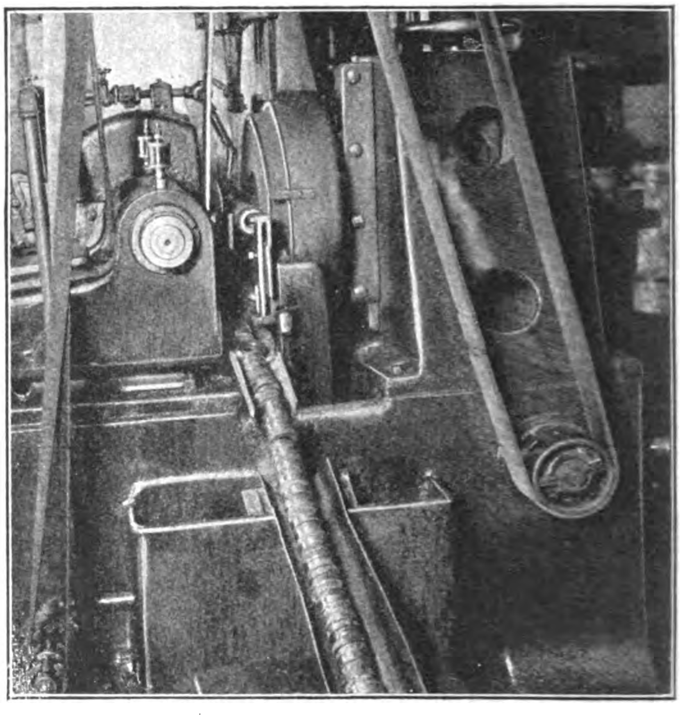


FIG. 8—VIEW OF REAR OF MACHINE AND GRAVITY CONVEYOR

controlled by the operation of the handwheel *F*, Figs. 2 and 6. This handwheel feeds the diamond back and forth across the face of the wheel.

The Desire to Grow

A. L. DeVinne

The city, the tree, or the manufacturing establishment that has ceased to grow, has already commenced to decay; and the same is true, in a certain sense, of the man. If he has no desire to grow mentally, he will fall behind in growth and usefulness, in comparison with those who have the will to push up and out and take firmer root. Once the foreman thinks that he knows it all, or that it is not worth while to learn more, he commences to be a "has been."

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Production Work in an Engine Lathe

By Irving Lake

The problem was to machine a batch of castings, as shown in Fig. 1, with an engine lathe as the only machine available. The work required boring to two diameters, reaming both bores to size and tapping in the center as can be seen by Fig. 1. Part of the solution at least is due to the use of milling cutters for reamers.

In order to secure uniform results as well as rapid production, a pot chuck was made as in Fig. 2, and also

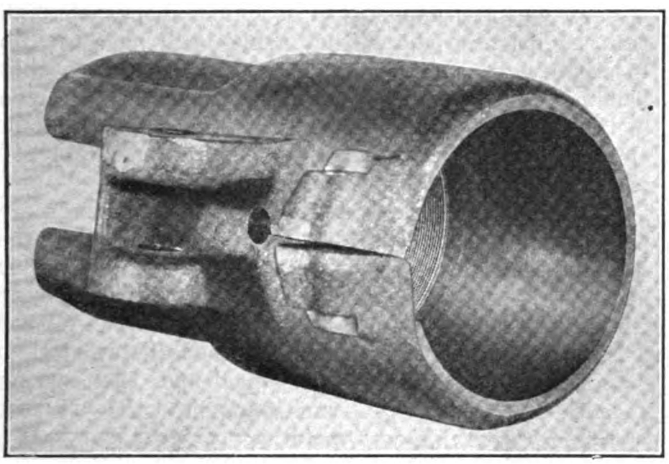


FIG. 1—THE WORK TO BE DONE

several special tools for handling the work. The chuck *A* was screwed to the spindle nose *B* and a pilot bushing *C* fitted to the taper inside the spindle as a guide for the boring bar *D*. This bar rested in a block *E* and was held in the tool block by screw *F*. The bar had a keyway at *G* to hold the reamers and taps which were used later. The toolbits *O*, *P*, *Q*, and *R* were all so placed as to cut on the upper side of the hole as it was found that they produced a better job in that position than in any other.

The boring bar was properly located by placing it on centers, and then running the cross-slide under it, using a suitable V-block *E* to secure the proper height. The pilot bushing *C* was then put into the spindle, and

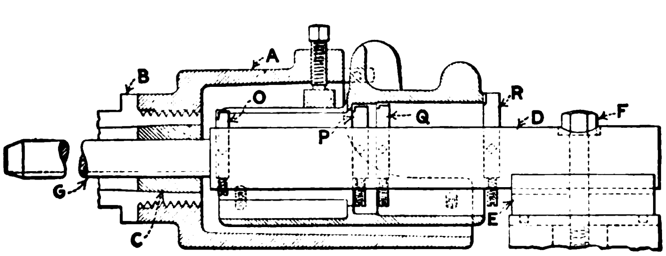


FIG. 2—THE CHUCK AND THE BORING BAR

the bar tried for accuracy between the tailstock center and the pilot bushing. The cross-slide gibs were set up tight and to avoid any chance of disturbing the setting of the bar, the cross-slide feed handle was removed.

Reaming the large end of the bore was an easy matter. The trouble came in reaming the small end with the two gaps, as these openings were approximately one half the diameter of the bore. Any mechanic will ap-

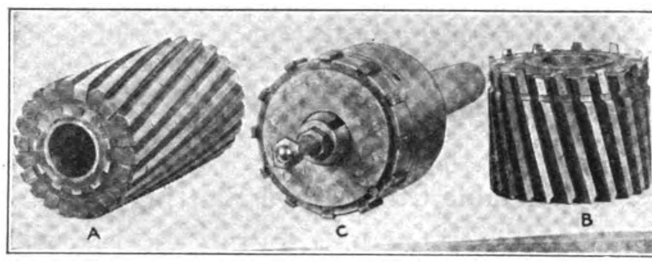


FIG. 3—REAMERS AND TAP

preciate just about how the ordinary reamer would behave. So in order to ream this open hole I secured the spiral slabbing cutter *A*, Fig. 3, and ground it to ream the desired size of hole. Then a key, fitted to match the keyway in the boring bar pilot, was set in the reamer and the reamer slipped on the pilot. A trial showed a round and accurate hole. The reamer for the big end of the bar was made out of a larger cutter shown at *B* in Fig. 3.

The tap *C* in Fig. 3 carries twelve chasers set as at *A* in Fig. 4. When entering the tap upon the pilot as at *B*, the chasers remain compressed by the springs *C*. By

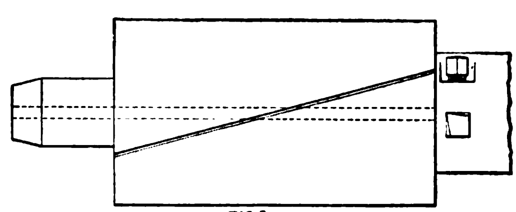


FIG.5

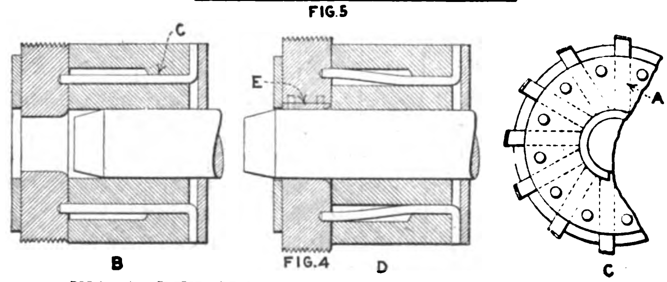


FIG. 4—DETAILS OF THE TAP. FIG. 5—SPIRAL REAMER IN PLACE

pushing the tap all the way back on the pilot the chasers are forced out by the taper end of the pilot and are then backed up by the pilot as at *D*. The chasers have shoes *E* pinned to their inner ends. These shoes can be re-

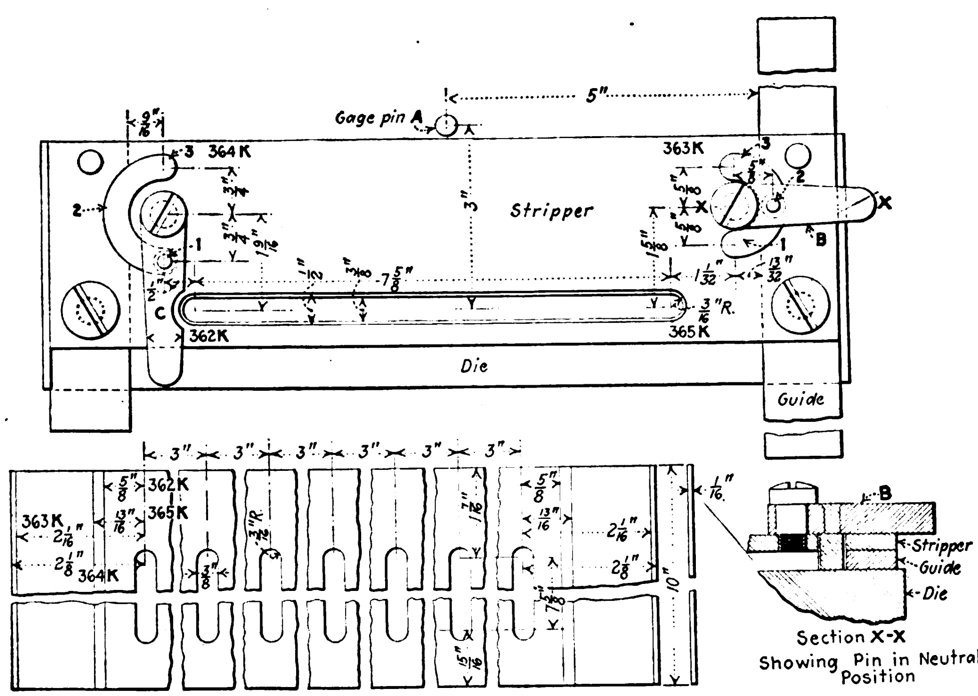
moved and shimmed to get any variation necessary in the size of the tap. While the tap would have worked perhaps as well with eight chasers, we wanted as many chasers as possible, as this tool was to be used to tap to a shoulder. This depended on the operator stopping the machine when the tap reached the shoulder and the greater the number of chasers would tend to prevent stripping the thread.

In operation the casting was placed in the pot chuck and the boring bar fed through the bore. When the boring operation was finished the feed was thrown out and the bar withdrawn from the work far enough to allow the spiral reamer *A*, Fig. 3, to be slipped on to the pilot as in Fig. 5. The bar with the reamer mounted on its pilot was now pushed through the bore and the bar was again withdrawn for enough to change reamers. After the second reamer was removed, the tap was slipped on the pilot and fed into the work until it came in contact with the shoulder at the end of the hole. The machine was then stopped and the bar and tap withdrawn. As the bar was withdrawn, the tap automatically collapsed as soon as the straight part of the pilot was disengaged from the inner ends of the chasers. Further withdrawing motion brought the tap out with the bar.

Variable Stops for a Slotting Die

By D. E. Smith

We had an order for a number of slotted plates of sheet iron, like that shown in the drawing, in which the distance from the edge to the center of the first slot varied. There were four kinds of the plates and the distances specified were $\frac{5}{8}$, $\frac{13}{16}$, $2\frac{1}{16}$ and $2\frac{1}{8}$ in. The distance between centers of the succeeding slots was 3 in. and was the same in all lots.



SLOTTING DIE WITH VARIABLE STOPS

A gage pin *A* in the die determined the latter measurement, but the method of locating the first slot at the required distance from the edge was a problem that required some study.

The various lots of stock were designated at 362-K, 363-K, 364-K and 365-K, respectively, and these numbers appear on the stripper as an index to the position of the auxiliary stop levers marked *B* and *C* on the drawing.

The levers are fulcrumed on the stripper and are each provided with a pin at a suitable distance from the centers upon which they swing. These pins extend downward through the semicircular slots in the stripper so that they are in the path of the advancing stock. Figs. 1, 2, and 3 indicate the various positions of the levers. When both are at position 2 they are in "neutral" and the stock may pass freely through the die. With either lever at either extreme position, its respective pin forms a gage to position the stock with respect to the distance from the center of the first slot.

After the first slot is punched, the lever is placed at position 2, and thereafter the stop pin *A* gages the work on its passage through the tools.

Catching the Thread by the "Jumping" Method

By B. A. Donley

It oftentimes happens in machine shops, especially railroad machine shops, that a man will have occasion to do threading upon a lathe that has neither backing belt nor dial. I have seen the following described method applied in many cases and, under the manipulation of an expert, it serves its purpose admirably. It is called "jumping the thread."

Assuming a lathe with a "four" ($\frac{1}{4}$-in. lead) leadscrew, a piece of work on centers to be cut with a thread that is not a multiple of the leadscrew, and the tool set for cutting. The lathe is started, the first chip run up to the desired length, and the tool is withdrawn. Without stopping the lathe, the locknut is opened and the carriage run back to the starting point.

Now, bringing the cross-slide up so that the point of the tool will just clear the outside diameter of the work, the locknut is dropped in and the position of the tool point relative to the partly cut thread is noted. Four positions are possible; to right of thread, to left of thread, on top of thread, and correct. To the skilled workman the position will be apparent at a glance.

With the right hand on the lever of the locknut and the left hand on the traversing wheel of the carriage, the lever is lifted just enough to allow the nut to clear the threads of the leadscrew and the carriage moved back one, two, or three threads as indicated; the number so "jumped" being clearly perceptible by the feeling. Noting that the tool is now in the correct position the operator instantly "jumps" the carriage back four more threads, locks in the nut, feeds the tool forward to the

stop, and proceeds to cut the second chip in the same manner as the first.

This method of procedure is followed until the thread is finished, the lathe not being stopped at any time, and the movements may be made accurately, even at high speeds, after the operator has become accustomed to them. In any event it is far quicker than stopping the lathe and scaling for position, which is the only other method possible under the conditions. It is hardly necessary to state, however, that in learning the knack the beginner should run his lathe very slowly.

When skill has been acquired, lathes with other leads than four—say three or five—may be handled as readily as the four. There are, of course, a corresponding number of false positions and the final jump must be made to cover the corresponding number of threads of the leadscrew, but the worker soon becomes adept and rarely makes a mistake.

The only objection that might be raised to this method is that it is likely to induce rapid wear of locknut and leadscrew. To offset this the writer knows personally of lathes that have been in daily service under these conditions for twelve or fourteen years and are still doing duty without repairs to these parts.

[The Editor has done this little trick many times, but always on threads of comparatively coarse pitch. He would hesitate to tackle the job of cutting a 32 or 36 pitch thread on a lathe with a five pitch leadscrew.]

Cutting Diamond Screws

By Joseph Hewes

A part of the product of our shop consisted of screws having square right- and left-hand threads cut over one another on the same part of the body.

As will readily be understood, the resulting threads were crossed, leaving a series of diamond-shaped projections on which either a right- or left-hand nut could be screwed. The usual method for producing such screws was to cut a complete thread of one hand

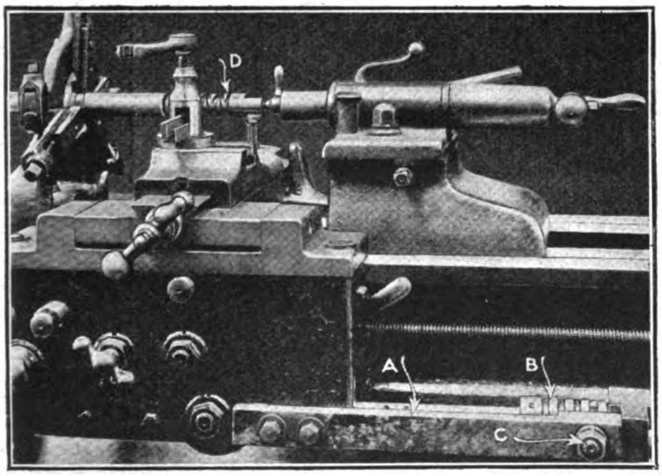


FIG. 1—LATHE RIGGED FOR CUTTING DIAMOND SCREWS (FRONT VIEW)

and then cut one of the opposite hand across it. To do this required two operations with the consequent loss of time in back travel of the carriage.

As there were many of these screws to make, we rigged up a lathe for the work, as shown in the illustrations herewith. The extension bar *A* was bolted on

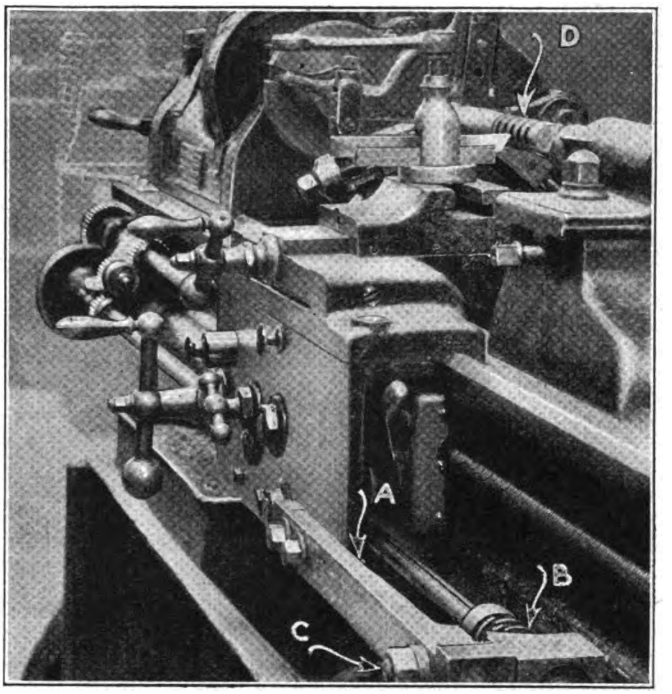


FIG. 2—LATHE RIGGED FOR CUTTING DIAMOND SCREWS (OBLIQUE VIEW)

the apron and carried at its outer end a bearing which was a running fit for a master diamond screw *B* fastened on the feed rod. A segment fitting between the threads and provided with a shank was pivotally attached to the bar at *C*. With the lathe running and all feeds disengaged, the carriage was moved back and forth by the master screw, the segment acting as a nut and entering the thread of opposite direction when its angle was changed by running against collars provided at each end of the screw.

With this arrangement it was only necessary to feed the tool in at the completion of each cycle of motion until the proper depth was reached, no withdrawal of the tool from work between cuts or reversal of the lathe being required.

The diamond screw being cut is shown at *D*. The same reference letters refer to like parts in both illustrations.

Who Remembers This Bicycle?

By George Wilson

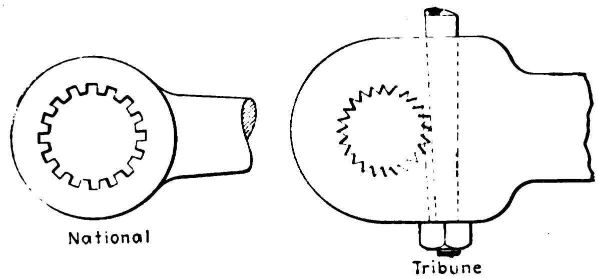
The article under the above title, by I. B. Rich on page 381 of *American Machinist*, brings to mind many incidents of the old bicycle days, for I guess I was a pretty ardent fan.

On the earlier wheels the cranks were attached by means of a taper pin slabbed off on one side to bind upon a flat milled on the sprocket shaft. The pin was driven home and held by a nut on its end. These pins were sources of trouble in that they would work loose, in which case it was impossible to keep them tight thereafter, as the corners would round off the flat on the shaft. Hardened shafts were not thought of in those days.

To obviate the loose crank all sorts of fastenings were devised until the one-piece crank and shaft, gotten out by Fauber, became generally used on most machines. However, the one-piece crank had the disadvantage that in order to assemble it in the bearings

the latter had to be too close together for good mechanical efficiency, that is, the sprocket and consequently the chain pull was too far out from the bearing.

Some designs had the crank and part of the shaft in one piece and joined in the hanger by means of a sleeve. A tongue and groove on the shaft ends locked the halves of the shaft together. This was the construction of the Columbia, Waltham and several other makes.



SPLINED BICYCLE CRANKS

A construction similar to that shown by Mr. Rich was used on the Tribune, a fine machine built by the Black Manufacturing Company. In this construction the shaft was splined, or toothed, and the taper pin retained as shown in the sketch. However, a few makers stuck to the flattened taper pin to the end, until the Fauber one-piece hanger came into general use.

To show to what extremes the makers would go to provide an original and efficient crank fastening I will mention that used by the Overman Wheel Co. on the Victor bicycle. In this construction the shaft was hollow for the sake of lightness. The ends of the shaft were necessarily closed by the bosses that received the cranks. These bosses were bored tapering at right-angles to the shaft, and the tapered ends of the cranks fitted into the holes. To prevent the cranks from turning in the bosses under the pressure of the pedal, keys were placed in both crank and boss.

While writing this it has just come to mind that a splined shaft method of crank fastening, in which the splines were square as in present auto practice, was used in the National bicycle. I think some sort of nut was also used to hold the crank on, but am not sure. I would like to have one of the old boys clear this up.

An Easy Method of Lettering

By Louis A. Schlosstein

The usual practice for placing notes or titles on detail drawings is to measure off the desired height of the letters and then lightly draw guide lines which will govern the size of the lettering. However, a shorter method of free-hand lettering has been used by the writer for a number of years and has proved a great time saver, at the same time producing a neat job.

A thin triangle may be placed on the sheet in position where the lettering is to be done and its edge may be used as a stop for all downward strokes of the pencil and for ruling the horizontal portion of the lower edge of the letters. This will be found to be a rapid way of doing neat lettering along straight lines without ruling the lower line. With practice, the letters can be made of a uniform height without drawing the usual top line on the tracing, while the straight edge of the triangle takes care of the lower line.

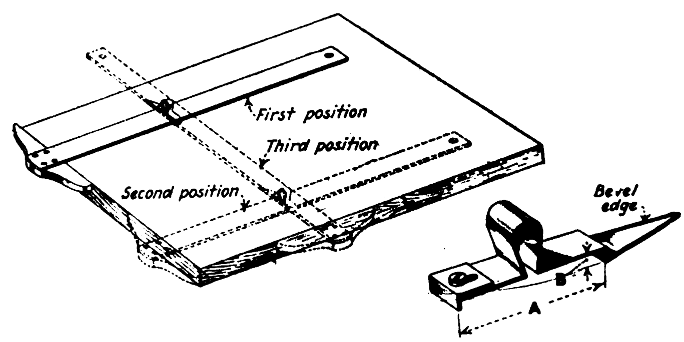
A little care will be necessary in making the letters the lower edges of which are curves such as: C, O, U, etc., as the curve must be started before the pencil strikes the straight edge. Capital letters as well as small letters may be made in this manner. When once a draftsman has "his hand in," he will always use this method.

A Drafting Room Kink

By Edward Heller

The little device shown in the accompanying drawing is very useful, particularly when large triangles are not available for drawing vertical lines that are required to be accurate. It is made of about $\frac{3}{4}$ x $\frac{1}{16}$ in. cold-rolled steel. The dimensions are made to suit the width and thickness of the T-square blade. One end is made adjustable so that it can be used on T-squares with blades of any width.

In use the device is snapped on the blade at the required location as shown in "first position," and a short line drawn against the beveled edge. The T-square is then moved to "second position" down the board and another line drawn in similar manner. The T-square is then used as a straightedge and a connecting line drawn through the two points thus obtained.



SUBSTITUTE FOR LARGE TRIANGLES

Fixture for Holding Goose-Necks

By J. Robert Phelps

The accompanying illustration shows a simple and inexpensive fixture used in the Atchison, Topeka & Santa Fe shops, San Bernardino, Cal., for holding tank goose-necks while machining the faces and valve seats.

The under side of the flange of the goose-neck rests on a shoulder in the interior of the fixture located just below the holding screws.

FIXTURE FOR HOLDING GOOSE-NECKS

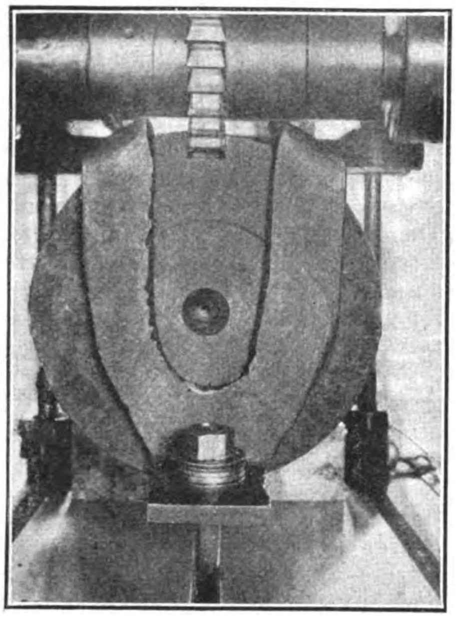
The fixture can be mounted on either a lathe or a boring mill where it should be chucked so as to run true before the goose-neck is inserted.

For drilling the necessary bolt holes in the flange of the goose-neck the fixture can be readily transferred from the lathe or from the boring mill to the table of the drilling machine.

Clamp for Holding Work in Keyseating

By J. Robert Phelps

The clamp shown in the accompanying illustration is in use in the shops of the Atchison, Topeka & Santa Fe Railway at San Bernardino, Cal., for keysetting locomotive axles. As will be seen from the illustration, the clamp proper is in one piece and can be quickly applied to the work without the blocking that would be required if two ordinary U-clamps were used. The cup pointed set-screws at the top hold the work firmly and serve in equalizing the clamping pressure. Neither the clamp nor its screws offer any interference to the cutter or arbor. The clamp can be made in a very short time by cutting from a sheet of heavy boiler plate by means of a gas or electric torch.



CLAMP FOR HOLDING WORK IN KEYSEATING

Enlarging Gas Engine Pistons—Discussion

By C. H. Skinner

I have read the article on the subject of enlarging gas engine pistons, by David Tyke on page 287 of American Machinist, as well as the letter of Ivan Beach appearing on page 638. In response to the editor's note, subjoined to the latter and requesting additional information from your readers, let me say that I have been enlarging pistons by heating for several years and find it successful if handled properly.

A charcoal fire is used and the piston is heated to a bright red. It is then covered with sawdust and allowed to stand until cool.. The pistons will expand from 0.012 to 0.025 in., according to the size and thickness of pistons. It is advisable to leave the old piston pin in place during the process as it serves to prevent any warping of the piston.

Pistons expanded by heat and re-ground have been found as satisfactory as new pistons, wearing very little in use. In all regrinding jobs, 0.0005 in. per inch of diameter of cylinder is allowed for clearance which has been found to produce a very good job.

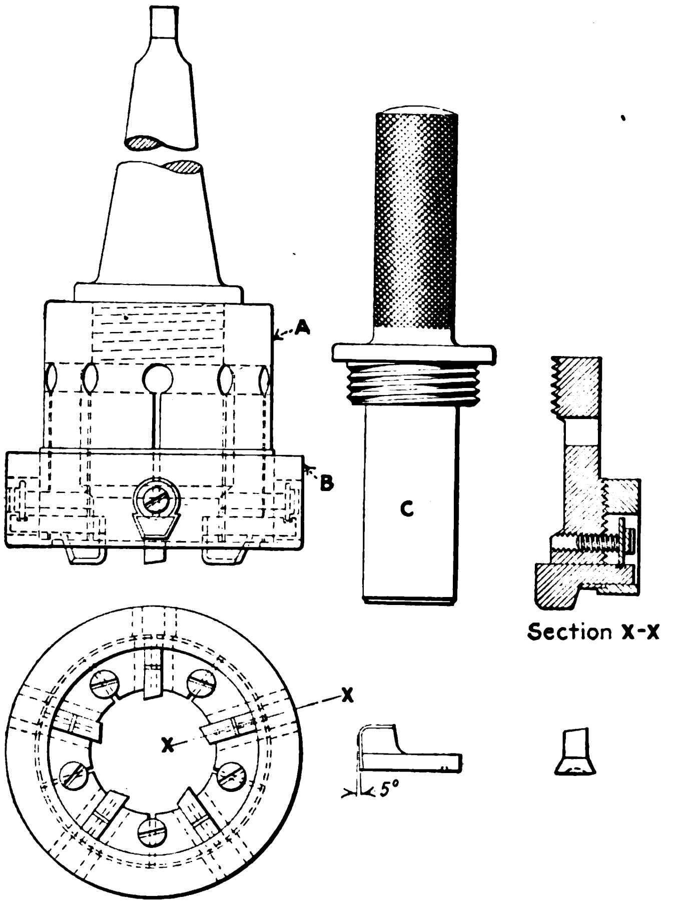
Inserted Tooth Hollow Mill

By Arnold J. Fleming

At a day's notice our shop was called upon to produce malleable castings to definite limits that hitherto had been good enough as they came from the foundry. Therefore, the castings had to be hollow milled.

We first made some mills from solid high-speed steel bar. These were too expensive. We also tried to purchase some but could not find any that we thought would do, so I designed this one.

The sketch shows the construction very plainly. The shell *A* is slotted in five places and the outer end of each slot was made to receive a correspondingly shaped cutter. Tapered head screws tapped into the end of the shell before the slots were cut serve to lock the cutters



INSERTED TOOTH HOLLOW MILL

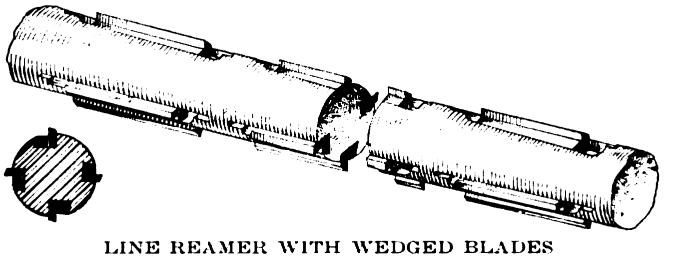
in position by expanding the shell inside the retaining ring *B*. The plug *C* screws into the shell for the purpose of setting the cutters.

Line Reamer with Wedged Blades

By L. E. Schaeffer

A line reamer with blades held in place by means of taper wedges instead of screws is shown in the accompanying cut.

The bottoms of the blades are inclined to a 5-deg.



LINE REAMER WITH WEDGED BLADES

angle which provides for the expansion of the reamer when necessary to regrind it. The wedges are tapered to 3 deg. in one plane and 15 deg. in the other, enabling them to hold the blades securely in place.

Editorial

How Machine Tool Design Will Probably Be Influenced

WHAT WILL be the next thing to exert a paramount influence on the design of machine tools? Will it be a new industry, standardization, competition, or a new tool steel? Old copies of magazines will show that we have come a long way from the frail machine that was once the best that could be bought.

As competition became keener more and more weight and power were given to machine tools so that they might do more work and reduce production costs.

The advent of Mushet and Taylor-White steels in turn showed that further strengthening of machines was necessary in order to work up to the capacity of the cutting tool. Multi-cutting and continuous cutting followed quickly and naturally—competition again.

The war, with its insatiable demands influenced further development of the single purpose machine and has undoubtedly left other influences on design.

What next? Machines are being built stronger and heavier than ever today. Single pulley and direct motor drives, wide belts, strong clutches and rigid holding devices are being designed and used, and now the capacity of the machine is greater than that of the tool steel.

Will not the next step be the improvement of the cutting tool? Experiments in alloying have been carried on for some time and have already produced alloys that are pointing the way toward greater production. There are, no doubt, other alloys that will be announced before long. We should not need to stretch our imagination to picture a continuance of the cycle—stronger tool, stronger machine.

Are You in a Rut?

WHEN you are up against a problem as to the best way to handle a production job; the sequence of operations and the design of the tools and fixtures, do you ever stop to wonder how the other fellow would do it?

When you are up against it to get more production out of the shop, do you ever go into some other fellow's shop where the same class of work is being done, and see how he is doing it?

You are bound to get into a rut at times and can only visualize one way of doing things—your own way; but is your own way the best way?

Did it ever strike you that you can sometimes learn more in a few hours trip through the other fellow's shop, seeing how he does things, than in working over your problems alone for a week?

Did it ever strike you that time spent in going through other shops with your eyes open for methods of doing work will amply repay you?

Did it ever strike you that intercourse with other shop executives is bound to result in your getting some helpful ideas as to how to do things better or cheaper?

If you are in a rut, get out of it. Don't be a stay-at-home forever. Get out into other shops and see what they are doing and how they are doing it.

Commercial Aircraft Cannot Be Developed in Arsenals or Navy Yards

THE Senate recently requested both the Secretary of War and the Secretary of the Navy to report on the feasibility of each arm of the service setting aside an arsenal or a navy yard for the manufacture of aircraft. The request grew out of the belief that aircraft are essential to national defense and that the aircraft industry cannot be developed through competition. The reply of both Secretaries was that the proposed plan was not feasible.

Nobody will dispute the statement that aircraft are essential as an arm of defense. But the idea that an aircraft industry cannot be developed except by governmental work through the Army and Navy is open to serious question. There is no doubt that many of the alleged benefits of competition have been over-rated, but an abandonment of the idea is hardly to be considered at this time. There is no question as to the possibility of building aircraft in both navy yards and arsenals. The splendid work of Capt. Coburn at League Island during the war is sufficient evidence. The difficulty is, that under the ordinary routine work of either Army or Navy, such men rarely find their way into the executive chair. In too many cases the man in charge happens to be on the list for such a position, due to seniority or other rulings, none of which depend on his fitness for the job. And unfortunately too many of the officers who really did things during the war have resigned from the service.

Government arsenals can undoubtedly build aircraft and the time may come when it is the proper thing to do. But our past experience with Army and Navy red tape, with the principal object of many being to play safe by never doing anything which has not been done before, does not encourage us to expect much from government aircraft building at present. Before it can be a success we all need a change of heart regarding our duty to the Government and its duty to us.

A few energetic and far-sighted men are putting commercial aviation across even though it be a slow and expensive process. At the present time probably the Aeromarine Airways Corporation stands out as actually doing a commercial business in various parts of the country.

More landing fields, the free use of all governmental fields by commercial fliers, rational federal control of flying and a greater development of the air mail service will do more for real aviation than the proposed building of aircraft by arsenals and navy yards.

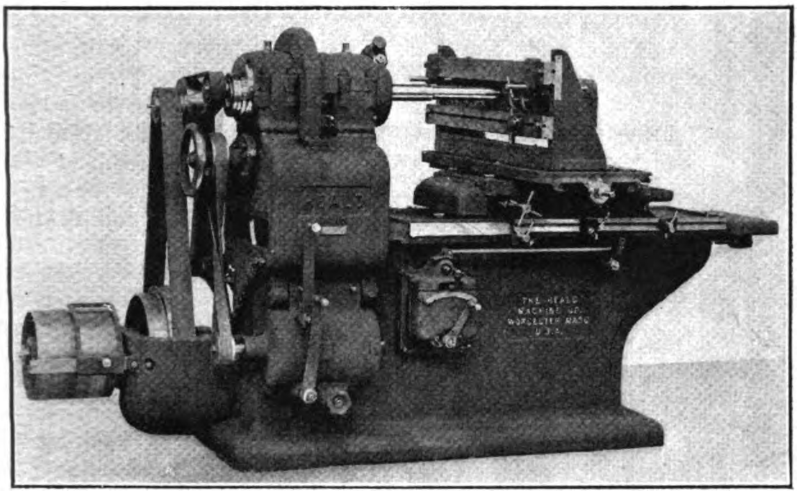
We are not keen on subsidies of any kind, but better far to grant a subsidy for commercial aviation than to drive out the few airplane builders who are actually working for the development of aviation. There are doubtless many more uses for arsenals and navy yards than those in vogue at present, but the development of a new industry cannot be expected from plants which have so many years been organized on a "stand pat" basis. We are strong for aviation and do not want to see it handicapped in the manner proposed.

Shop Equipment News

Heald No. 50 Cylinder Grinding Machine

A cylinder grinding machine designated as style No. 50 has been added by the Heald Machine Co., of Worcester, Mass., to its regular line. This machine, though built along lines similar to the previous model, is more massive in construction and embodies some ingenious features. It may be furnished for either belt or motor drive.

The drive shaft of the machine is mounted on ball bearings at the rear of the base in such manner that it may be removed entirely without disturbing other parts.



HEALD NO. 50 CYLINDER GRINDING MACHINE

In the belt-driven type of machine the power is delivered to this shaft directly from the main line without the intervention of countershafts. The tight and loose pulleys are 12 in. in diameter by 5 in. face, and run at a speed of 750 r.p.m. The loose pulley is also carried on ball bearings. The drive to the eccentric grinding shaft is by belt over a spring-suspended idler, as in the former machines.

The work table has been made somewhat wider than formerly, and automotive cylinder blocks of the largest size may be mounted without undue overhang. A vertical adjustment of $\frac{1}{16}$ in. to compensate for possible mis-alignment of the bores in a block of cylinders is provided by means of a pair of inclined planes, or sliding wedges, between the main table and the cross-slide or work table. This adjustment is easily and quickly made by turning a small capstan-head screw, and does not affect the point of reversal of the work with relation to the position of the grinding wheel.

A noteworthy feature of the machine is the absence of gear boxes. Power for reciprocating the table is transmitted through an hydraulically operated mechanism that is susceptible to minute variations of speed from zero movement to a maximum speed of traverse of 15 ft. per minute. This adjustment of speed from minimum to maximum is made by one movement of a throttle lever, the position of which in its quadrant determines and indicates the speed. The table movement is entirely free from vibration and shock at the point of reversal, even at the highest rate of table travel.

The rotative movement of the eccentric grinding head is derived from a belt running over a pair of three-step cones within the base of the machine. This belt is shifted by means of a lever on the front of the machine, and the shifting is stated to involve even less trouble than the movement of a gear-shift lever. Compensating adjustment for belt stretch is provided to maintain the belt under even tension.

The cross-slide, directly upon which the work is mounted, has a movement of 28 in. in a direction at right angles to the table traverse and is provided with a large micrometer dial on the cross screw, by which fine adjustment of center distance is easily secured.

The wheel spindle regularly furnished for regrinding automotive cylinders will grind holes $2\frac{3}{8}$ to 3 in. in diameter, in lengths up to 11 in., and also holes larger than 3 in. in diameter in lengths up to 18 in. For manufacturing work, the standard 15-in. spindle arm is regularly furnished for grinding from 3 in. in diameter and larger, and lengths up to 15 in. Other spindles for grinding smaller holes may be furnished. The belt pulleys are easily removable and interchangeable to secure proper grinding speeds. No adjustment of the belt tension is necessary, as that is taken care of by the spring idler.

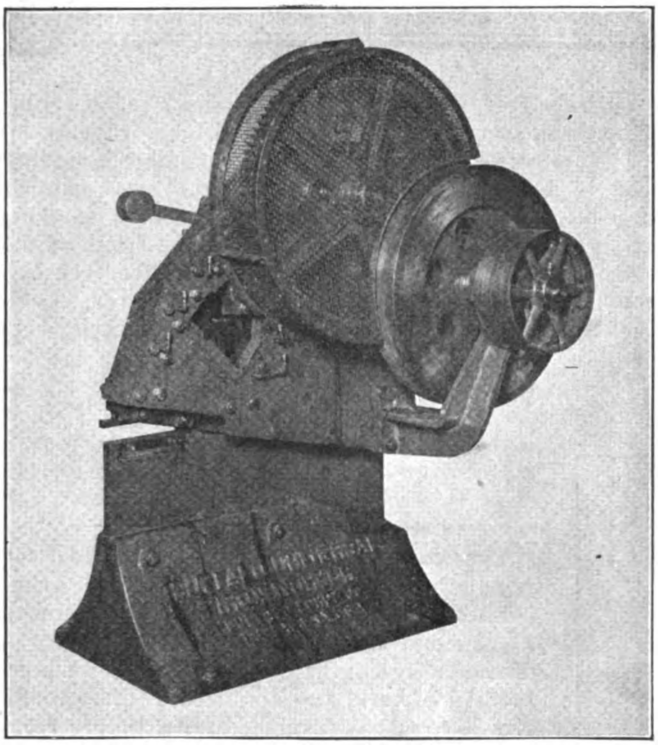
The finished surface of the cross-slide is $43\frac{3}{4}$ x $16\frac{3}{4}$ in., and there are two T-slots extending the full length. The floor space occupied by the machine is 73 x 123 in., and the weight is approximately 5,000 pounds.

Buffalo Universal Slitting Shear and Bar-Cutter

The Buffalo Forge Co. of Buffalo, N. Y., has just placed on the market a universal slitting shear and bar-cutter, the driving side of which is illustrated. The machine is intended particularly for use where a punch is not needed, for example in iron shops, warehouses and similar locations.

The shear is equipped with 10-in. knives, which can cut plates $\frac{1}{2}$ in. thick of any length and width, or 6 x $\frac{5}{8}$-in. flats. The knives may be operated at the rate of thirty strokes per minute. The bar-cutter has standard five-piece knives which can cut structural shapes up to the following sizes: 4 x 4 x $\frac{3}{8}$-in. angles, 3 x 3 x $\frac{1}{4}$-in. angles at 45-deg. miter either left- or right-hand, 3 x 3 x $\frac{3}{8}$-in. tees, round bars up to $1\frac{5}{8}$ in. in diameter, and bars up to $1\frac{1}{2}$ in. square. With special knives that can be furnished the bar cutter will take 5-in. 9.76-lb. beams and 5-in., 9-lb. channels, or any other rolled section having the same weight and area of cross-section. One set of blades shears both channels and beams of the same size, and a different pair of blades is required for each size.

The machine has the Buffalo "armor-plate" frame, which is claimed to be unbreakable in service. The bearings are bronze-lined and the drive shaft bearings are oiled by means of rings. The gear and pinion are cut from semi-steel blanks. Since the base of the machine is cast iron, a large concrete foundation is unnecessary.



BUFFALO SLITTING SHEAR AND BAR-CUTTER

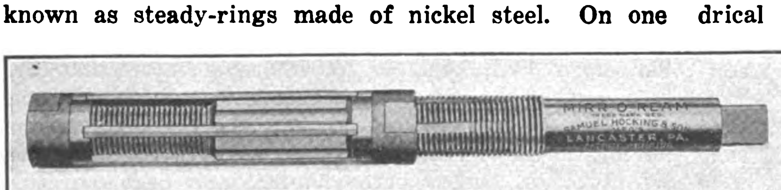
Approximately 3 hp. is required to operate the machine at full capacity. The length of the entire machine is only 5 ft. 4 in., the width 2 ft. 8 in., and the height 6 ft. 4 in. The total weight is 4,500 pounds.

Hocking "Mirr-O-Ream" Expansion Reamer

The inserted-blade expansion reamer shown in the accompanying illustration has recently been brought out by Samuel Hocking & Son, Lancaster, Pa. The adjustment in size is made by moving the blades along the slots, the depth of which decreases from the front end to the shank end of the tool. The shanks are made of alloy steel, and the blades of semi-high-speed tool steel.

The blades are ground with a double relief. The top of each blade is ground with a narrow land back of the cutting edge to give the proper relief. Near the back edge the blade is ground at a greater angle, in order to increase the relief and prevent dragging on the bore being finished. The method of grinding is stated to give a free cutting and durable edge.

The blades are held in place at each end by parts known as steady-rings made of nickel steel. On one side of each ring there are slots to receive the ends of the blades. The rings thus support the blades and prevent injury and breaking, particularly when the reamer is adjusted to its maximum size. The adjusting nuts operate against the smooth back surfaces of the rings, so that adjustment is easy and injury to the nuts or blades is not apt to occur.



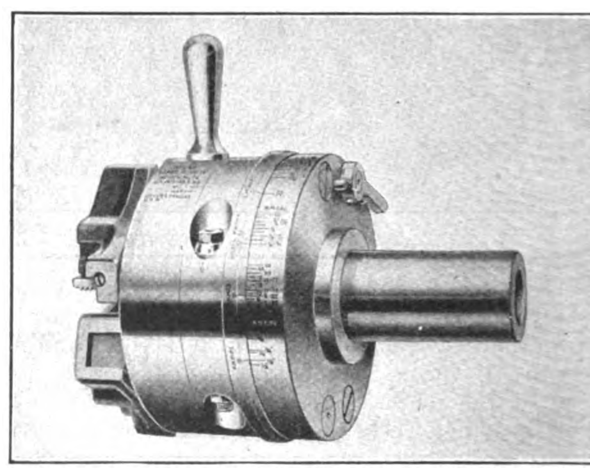
HOCKING "MIRR-O-REAM" EXPANSION REAMER

When adjusting the size of the reamer, the shank is held in a vise, and a micrometer used to determine the size over the cutting edges. The tool is ordinarily adjusted so as to take very light cuts in the hole. In this way, more accurate work and greater smoothness of finish can be obtained.

The tool is made in seventeen sizes, and can be furnished in sets. The smallest size can be adjusted in diameter from $\frac{15}{32}$ to $\frac{17}{32}$ in., has blades $1\frac{3}{4}$ in. long, and is $5\frac{1}{2}$ in. long overall. The largest size can be adjusted from $3\frac{1}{2}$ to $4\frac{1}{16}$ in. in diameter, has a blade length of $7\frac{3}{4}$ in. and a length overall of 24 inches.

Landis Automatic Die Head

The Landis Machine Co., Waynesboro, Pa., has recently placed on the market the automatic screw-cutting die head illustrated herewith, for application to turret lathes and hand screw machines. The principal feature is that the chasers are supported on the face of the head, which permits of easy access to the chasers when it is necessary to remove them for grinding and changing from one size to another.



LANDIS AUTOMATIC DIE HEAD

The head is made entirely of steel and constructed to give long life. It is applicable to practically all makes of screw machines and turret lathes on which the diameter of the head can be accommodated. The head employs the regular Landis flat chasers. The style and size of the shank can be furnished to suit the requirements.

The head is opened automatically by retarding the forward motion of the carriage, and is closed by hand. It is locked by the engagement of two hardened cylindrical lock pins in hardened bushings. The correct sizes for the roughing and finishing cuts are obtained on the $1\frac{1}{4}$-, 2- and 3-in. heads by the movement of the lock-pin lever. When cutting threads in one pass, both lock pins are engaged. When cutting threads in two passes, both lock pins are engaged during the first cut, but for the second cut only one lock pin is engaged. The cutters are adjusted to

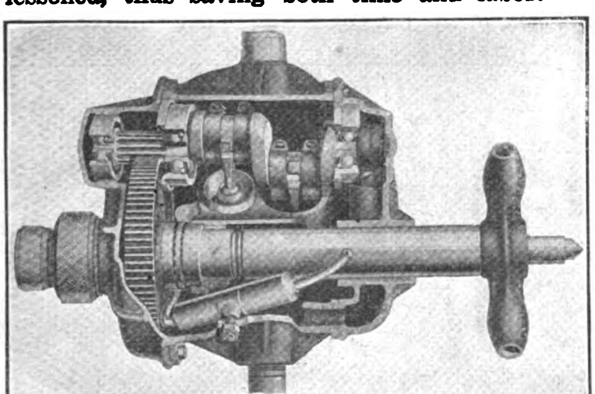
give the proper diameter of work by means of an adjusting screw, which engages the body of the head inside the rings. Since the operating, adjusting and closing rings remain in a fixed position when the head is closed, rotating the body within these rings gives all diameters that can be threaded within the range of the head. Each head is graduated for all sizes within its range of bolts, both right- and left-hand, and of right-hand pipe threads. To adjust the 1¼-, 2- and 3-in. heads for left-hand threading, reverse the position of the lock-pin lever in relation to its position for right-hand threading.

The chaser holders and trunnions on the ⅝- and ⅞-in. automatic heads are integral. The one set of chaser holders furnished with each head is suitable for threading all bolts and pipe within its range. When pitches and diameters other than U. S., "V," S. I., Whitworth and Briggs standards are to be threaded, special chaser holders with trunnions integral will be supplied. The chaser holder and trunnion may be easily removed from the die head by merely removing the shank and loosening one screw. These smaller heads are not equipped with roughing and finishing attachments.

The chaser holders and trunnions furnished with the 1¼-, 2- and 3-in. automatic die heads, such as illustrated, are separate. The heads are ordinarily furnished with right-hand bolt-chaser holders for cutting U. S. standard diameters and pitches. For threading pipe or cutting S. A. E. diameters and pitches, or diameters and pitches other than U. S., "V," S. I., Whitworth and Briggs standards, the proper chaser holders can be supplied. These larger heads are equipped with roughing and finishing attachments.

Developments in Chicago Pneumatic Drill

In order to obviate the necessity for frequent oiling of its pneumatically operated hand-portable drills, the Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y., has recently developed an oil vent that can be attached in the interior of the drill. The oil vent is applicable to most sizes and types of the "Little Giant" pneumatic drills. Its purpose is to prevent leakage of the oil so that the frequency of oiling can be lessened, thus saving both time and labor.



CHICAGO PNEUMATIC DRILL WITH OIL VENT

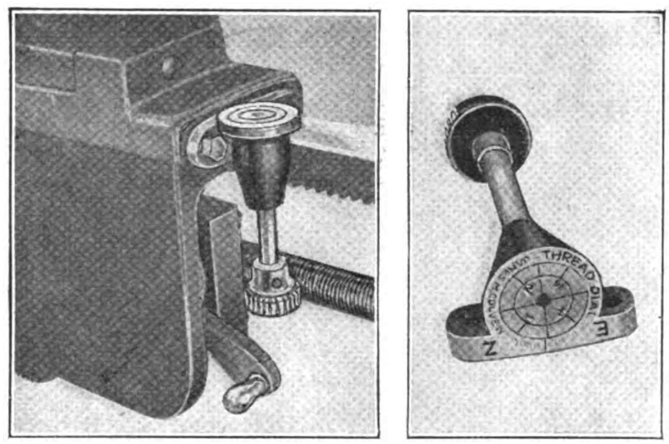
The oil vent can be seen in place in the cut-away section of the drill shown in the accompanying illustration. It consists of a sliding plunger having a cone at each end. Since this plunger is free to travel and close the passage of the oil from the drill, it prevents leakage no matter in what position the tool is operating.

The piston and connecting rod units, or toggles, are now made interchangeable in the drill. The connecting rod is fitted to the piston by means of a ball-and-socket joint. Two of them are secured in place on each crankpin by means of hinged split collars. The advantage of the arrangement is that it provides a large opening by which the lubricant can reach the crankpin bearings.

It is possible to assemble and disassemble any of the connecting-rod units without dismantling the entire drill. The mechanism is 30 per cent lighter in weight than that previously employed.

"E-Z" Threading Dial

A dial for attachment to lathes doing threading work has recently been placed on the market by James M. Colven, 20 Wolffe St., Yonkers, N. Y. The device, designated as the "E-Z" threading dial, is shown in the accompanying illustration both attached to and separate from a lathe carriage. The method of attaching the dial is very simple, as it is necessary to use only two screws in securing it to the carriage.



"E-Z" THREADING DIAL

The device consists of a cast-iron bracket carrying a brass sleeve, a brass dial, steel shaft and a brass worm gear. The worm gear is suited to the pitch and thread form of the lead screw on which it runs, and it is ordinarily covered by a small guard.

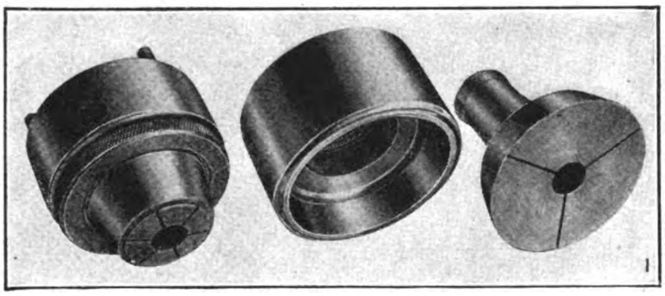
Since 4 in. travel of the carriage represents one revolution of the dial, it is easily possible to engage the half nut on the lead screw at the proper point, so that consecutive cuts can be taken in the same thread. When cutting an even number of threads per inch, the nut can be engaged when any one of the eight marks on the dial are opposite the index mark on the bracket. When cutting an odd number of threads, the nut can be engaged when any one of the four numbered lines are opposite the index mark. The dial can be used when cutting threads having a fractional number of turns per inch, as for 11½ threads the nut can be engaged at every one-half revolution of the dial.

The use of the device eliminates the necessity of stopping and reversing the lathe at the completion of each cut through the thread, and the lathe may be run continuously until the thread is finished. At the end of each cut the half nut is disengaged, the carriage is returned by hand, and then the nut is engaged when the dial indicates that the tool is in the proper position for the thread. The time of the operator can thus be

applied to cutting the thread, without the necessity of waiting while the tool is being run back through the thread. The dial aids in working close to a shoulder or boring to depth. When a lathe is equipped with the dial, it is not necessary to have a reversing belt.

Hartford Combined Collet and Step Chuck

The Hartford Special Machinery Co., Hartford, Conn., has just placed on the market a combination step and collet chuck intended for use on lathes and similar machines that are not provided with a through hole in the spindle, and also for use where a drawbar with the handwheel at the rear end of the spindle is undesirable. The chuck possesses the advantage of



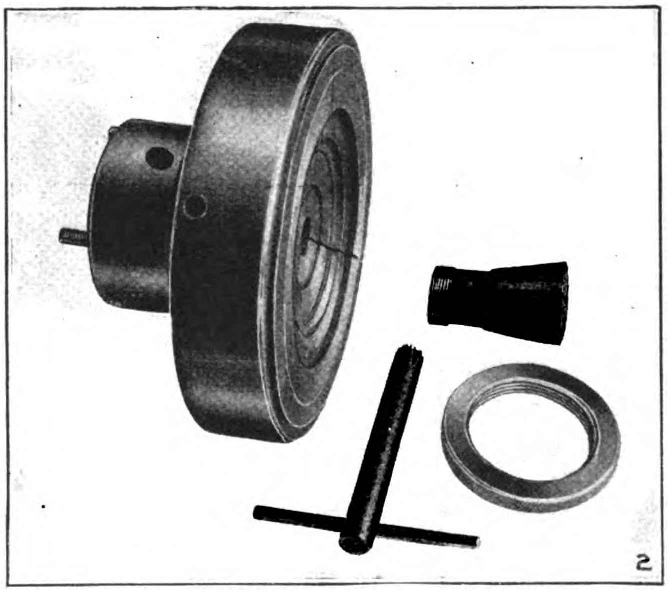


FIG. 1—HARTFORD COLLET CHUCK ASSEMBLED, AND SMALL CLOSING RING AND STEP COLLET. FIG. 2—CHUCK ASSEMBLED WITH LARGE SIZE CLOSING RING

admitting relatively larger sizes than usual, for the reason that the stock does not have to pass through a drawbar.

In Fig. 1 is shown the collet chuck complete at the left, while the other two parts shown in the same figure are the closing ring and step collet of the smaller size of step chuck. In Fig. 2 is shown the device assembled with the larger size of closing ring and step collet, and with the internal collet and thread guard ring shown at the right.

The same body is used for either combination. It does not screw directly upon the spindle nose, but is fastened by means of three long fillister-head screws to a small faceplate or chuck collar in the same manner as an ordinary lathe chuck. These faceplates must, of course, be fitted to the spindle nose of the machine upon which the chuck is to be used.

Within the body of the chuck is an annular bevel gear, mounted upon ball bearings and threaded internally to match the threaded end of the collets. This gear is turned to tighten the collets by means of the pinion wrench, which is inserted for this purpose in the hole that may be seen in the body of the chuck.

Internal collets are provided to hold all commercial sizes of round stock up to 1 in. in diameter. For work above that size the internal collet is taken out by backing the ring gear with the wrench, the knurled guard ring is removed, and the closing ring screwed upon the thread thus exposed. The step collet is now inserted and the ring gear turned forward to draw it to place.

Two sizes of closing rings are furnished with the chuck, and any number of step collets, especially fitted to whatever work is to be held, may be used. By means of the larger size of closing ring and corresponding step collet, work up to 8 in. in diameter may be held.

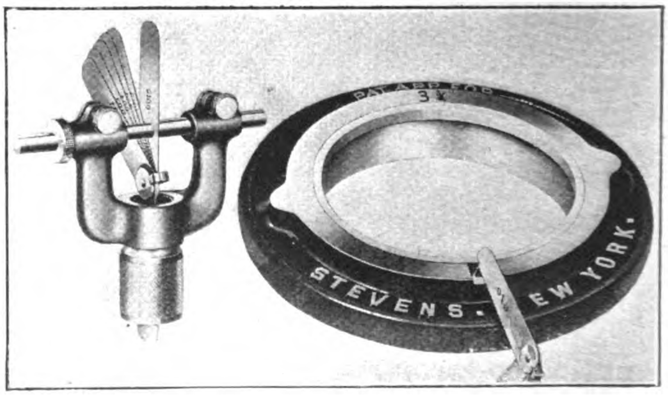
Stevens Cylinder and Piston-Ring Gages

Stevens and Co., 375 Broadway, New York, N. Y., have recently placed on the market some gages for facilitating repair work on automotive engines. At the left of the accompanying illustration is shown a microgage used in measuring the size of cylinders. The device consists of one fixed pin and one adjustable pin mounted in a holder. It is supplied in standard sizes to fit the size of cylinder to be measured.

The combined length of the two pins equals the standard diameter of the cylinder. In order to measure an over-size, a thickness gage can be inserted between the two pins. In this way, the oversize can be accurately determined. The tool is of particular use when fitting new pistons or new rings in the cylinder. It can be furnished with pins of the length desired, and with a thickness gage.

The ring gage shown at the right is intended for use when fitting piston rings, so that the fitting work can be done at the bench without the necessity of fitting directly to the cylinder block. First, one ring is fitted to the engine cylinder. This ring is then placed in the ring gage, and the opening measured by a thickness gage. By duplicating the measurement for all of the rings, correct fits can be obtained.

One side of the bore of the gage is chamfered slightly,



STEVENS CYLINDER MICRO-GAGE AND PISTON-RING GAGE

so that the rings can be easily inserted. The slot enables testing with the thickness gage. The device can be furnished in standard sizes and over-sizes to fit any make of car.

LeBlond 11-Inch Heavy-Duty Rapid Production Lathe

An 11-in. lathe for heavy-duty and large production where quick manipulation is required has recently been brought out by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. The lathe is similar in most respects to the larger heavy-duty LeBlond lathes.

The headstock is of the selective-speed type, and provides six speed changes from 50 to 250 r.p.m. by means of sliding gears. The constant-speed driving pulley is 12 in. in diameter, and is driven by means of a 3-in. belt. A multiple-disk automobile type of clutch is used that runs continuously in oil supplied from the same source that floods the gears and bearings. The speeds are controlled by two change levers. The starting and stopping lever applies a friction brake on the spindle when the driving clutch is released, so as to prevent coasting. The driving pulley is carried on a bushing, so that the belt pull is relieved from the drive shaft.

The gears are made of nickel steel, and have stub-form teeth. The sliding gears are mounted on high-carbon-steel shafts fitted with four keyways, which are broached from the solid in the gears. The spindle runs in tapered babbitt-lined bronze bearings adjustable for wear, and it is provided with ball thrust bearings. The entire driving mechanism is inclosed in an oil-tight casting. The large hole in the spindle permits of passing work through it, and mounting draw-in or expansion chucks.

The bed is very deep in section and strongly braced. The carriage is long, and has a bearing for its entire length on the bed. The apron is of rectangular box form, cast in one piece. Both feed motions are operated by a single clutch, and are so arranged that only one feed can be in operation at a time. A plain block rest

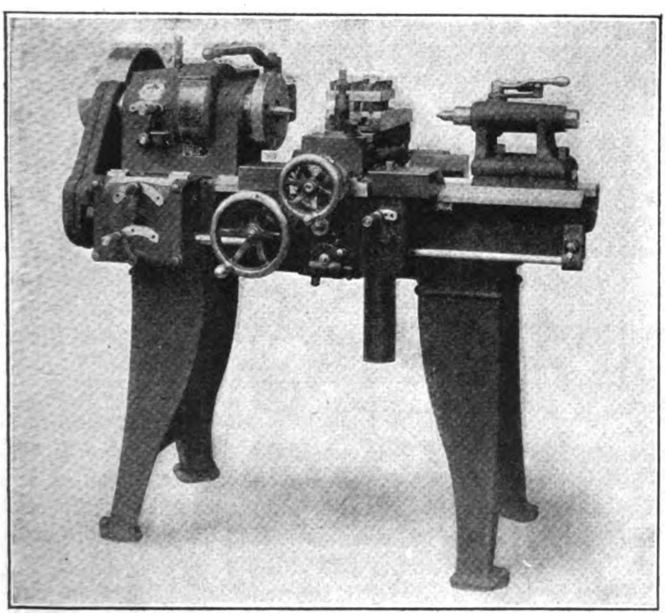


FIG. 1—LE BLOND 11-IN. RAPID PRODUCTION LATHE

and toolpost are ordinarily provided, although a turret toolpost can be furnished.

The feed box is of the automobile change-gear type, and provides nine feeds from 0.008 to 0.092 in. per revolution. All gears are made of heat-treated alloy steel. Two levers control the changing of the gears. The bottom lever compounds the feeds obtainable with the top lever, so that quick change from roughing to finishing feed is provided. The feed box is driven directly from the spindle by means of a roller sprocket chain adjustable for tension.

The tailstock is arranged to move and clamp the spindle by a single movement of the operating handle. The spindle has a travel of 2½ in. When work is being placed in the machine, the center can be brought in contact at the desired pressure by pushing the lever, and further movement clamps the spindle.

A facing attachment can be supplied. It enables facing and turning simultaneously, so that the lathe is converted into a semi-automatic machine that can handle many small jobs. The rear view of the machine in Fig. 2 shows how the facing attachment can be mounted

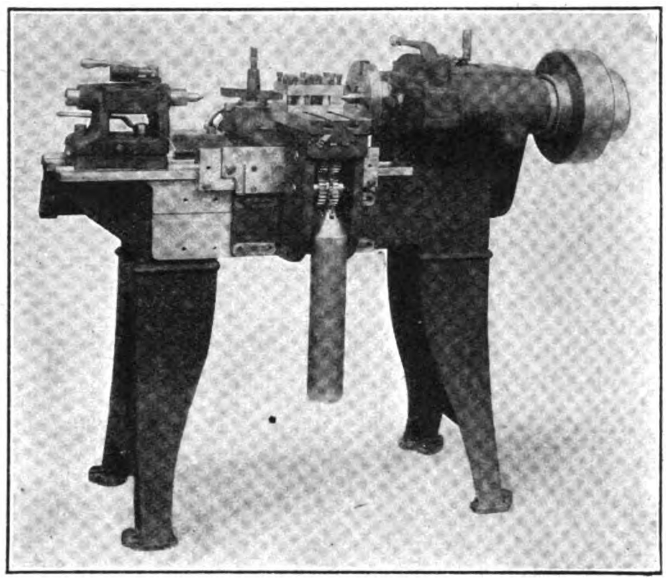


FIG. 2—REAR VIEW OF LE BLOND LATHE SHOWING FACING ATTACHMENT

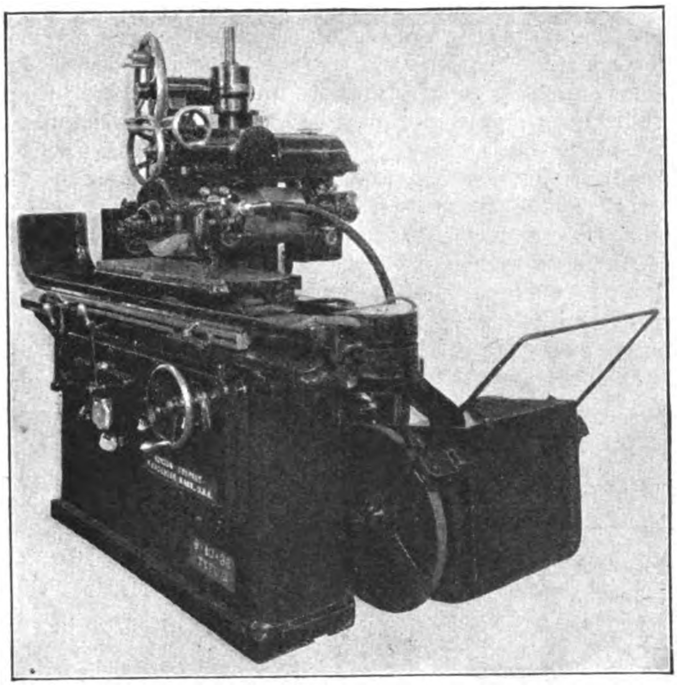
on a bracket bolted to the planed pad on the bed. The cast-iron form plate travels with the carriage, and is easily replaceable with one having the desired degree of taper, so as to vary the ratio of feed between the carriage and the facing slide.

The roller on the facing attachment engages this form plate and transmits the motion through a rack and a pinion to the facing slide, which is fed toward the center of the lathe on broad dovetailed ways. As the carriage is brought back along the bed to the starting position, the facing attachment is returned automatically by the weight. The multiple toolblock can be supplied to suit the work being performed.

The machine has a capacity to turn diameters up to 13¾ in., and lengths up to 18½ in. The bed length is 4 ft. The machine weighs 1,050 lb. net when equipped with a facing attachment, and 1,340 lb. when packed for shipment.

Norton 6 x 10 x 36-In. Surface Grinding Machine

The surface grinding machine illustrated herewith is a recent addition to the line of open-side surface grinding machines made by the Norton Co. of Worcester, Mass. The machine is intended for high production with great precision. The finished surface of the table is 6 x 36 in., and work 8½ in. wide may be ground. The height from the table to the lower side of a 10-in. wheel is 10¼ inches.



NORTON 6 x 10 x 36-IN. SURFACE GRINDING MACHINE

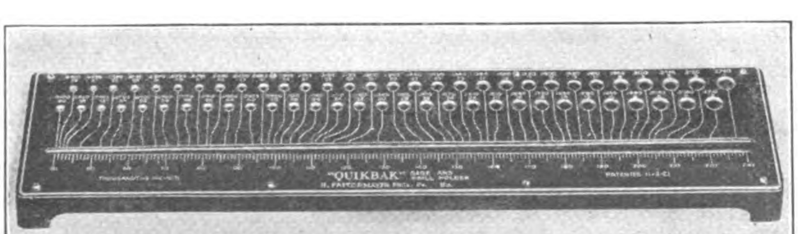
The chief feature of the machine is the improved spindle construction, as flood lubrication and thumb-screw adjustments for both radial and end thrust are provided. The thrust is taken by a hardened steel flange running between bronze washers. A standard grinding wheel 10 x 3 in. in size, with a 3-in. bore and held between 5½-in. flanges is used. The wheel spindle runs at 1,342 r.p.m, and is driven by a 4-in. belt. The main drive shaft runs at 815 r.p.m. and is driven by a 5-in. belt from a 15-hp. motor mounted at the rear.

The table runs at a speed of 80½ ft. per minute. The hand traverse mechanism engages automatically when the power traverse is disengaged. The cross-slide has two hand-operated feeds with a ratio of 1 to 38 between them. The vertical feed of the wheel can be power operated, and gives a feed of 0.00025 in. for each graduation on the index wheel.

The grinding lubricant is contained in a portable tank at the rear of the machine. This tank can be easily removed and cleaned in a few moments without seriously interrupting the operation of the machine. The machine is 6 ft. 3 in. in height, and requires 10 ft. 8 in. x 5 ft. 3 in. floor space, including the extreme overhang of the table. The weight is 6,500 pounds.

"Quikbak" Drill Gage and Holder

Harry Faltermayer, 1615 Sansom St., Philadelphia, Pa., has recently placed on the market the "Quikbak" gage and holder for twist drills. As can be seen in the accompanying illustration, the device is provided with holes in which the drills can be held vertically, and also with a tapered slot or V for measuring their size. The base is made of cast iron, although the V is formed by hardened and ground steel strips rigidly mounted in the base. An etched brass plate, having raised markings, forms the cover plate.



"QUIKBAK" DRILL GAGE AND HOLDER

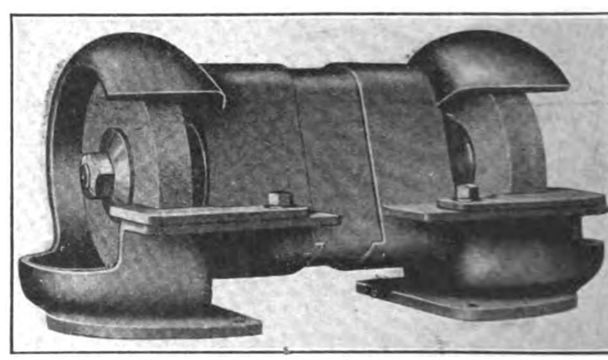
Since drills designated by wire gage sizes are uniform in diameter throughout the entire length, the V-gage can be employed to quickly determine their size. The shank is merely inserted in the slot and then moved down as far as possible toward the small end of the V. The guide line at the point where the drill stops leads to the proper hole for the drill. Each hole is marked with both its gage number and size in decimals of an inch.

On the front side of the slot is a scale graduated in thousandths of an inch on which the diameter of the part inserted in the V can be read. Thus the gage can be used for quickly and easily determining the exact size of drill rod and round pieces, without the use of a micrometer. A bench space of 13½ x 3¼ in. is required.

Forbes & Myers Grinder With Flat-Front Motor

A small bench grinder, designated as Model 76, and providing clearance for the work in an unusual manner, has recently been placed on the market by Forbes & Myers, 172 Union St., Worcester, Mass. As shown in the accompanying illustration, the front of the motor frame is flat. This construction is obtained by using a squirrel-cage induction motor having windings on the back side of the stator only. The windings are compensated, so as to avoid undue heating and to provide satisfactory starting qualities.

When 6-in. wheels are used, they project 1¼ in. further forward than the front of the motor, thus making it possible to wear down three-fourths of the abrasive



FORBES & MYERS GRINDER WITH FLAT-FRONT MOTOR

before the wheel is even with the front of the motor. The motor has ½ hp., and can be operated on either two- or three-phase, 60-cycle current of 110, 220, 440 or 550 volts, to suit the conditions. The speed is ordinarily 3,600 revolutions per minute.

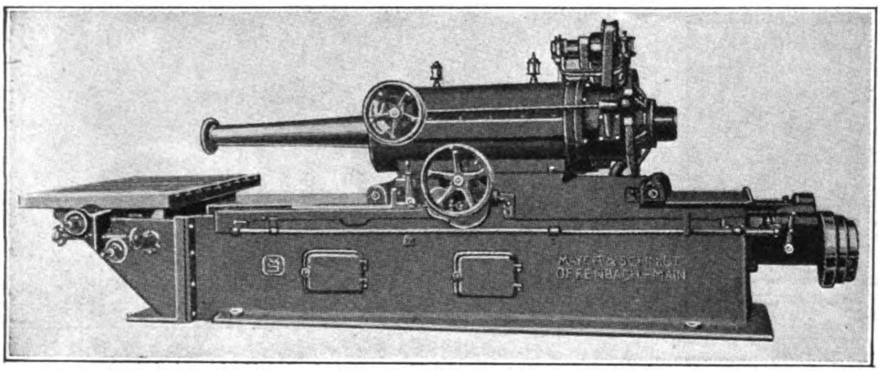
Guards are provided for the wheels. Flat, steel tool-rests adjustable in two directions are mounted on the front of the machine. The wheel flanges are 2¾ in. in diameter and bear on the outer edges only. The spindle is ¾ in. in diameter and runs in Norma ball bearings.

The height of the spindle above the bench is 4¼ in., or a stand can be furnished to make the spindle 40 in. above the floor. The weight of the bench-type machine is 35 lb.; with the stand 140 pounds.

M. S. O. Automatic Internal Cylinder Grinding Machine

The accompanying illustration shows the M.S.O. automatic internal cylinder grinding machine that is being introduced into this country from Europe by Marburg Bros., Inc., 90 West St., New York, N. Y. This machine, designated as Type FX-10, differs from the grinding machines ordinarily made in this country not only in the large range of sizes in which it is built, but also in the arrangement of the grinding head and work table.

In most small cylinder grinding machines, the grinding head remains stationary while the work table is moved back and forth automatically. In the machine here shown, however, the work remains stationary while the grinding head is reciprocated. The operation is entirely automatic. The machine is regularly built in seven sizes, suitable for grinding cylinders of from 1 or 2 in. up to about 32 in. in diameter and of lengths up to about 80 in. The construction is very rigid, and a high degree of accuracy in performance is guaranteed.



M.S.O. AUTOMATIC INTERNAL CYLINDER GRINDING MACHINE

The grinding head slides on the heavy bed, and is moved longitudinally by automatic feed, while the operating speed is changed by means of cone pulleys. The automatic reversal is adjustable as to position, and takes place without shock. The automatic movements can be quickly released, so that the head can be moved freely by hand. All bearings and operating surfaces are liberally proportioned and run in oil.

The grinding spindle both rotates around its own axis and revolves about another axis parallel to its own. The eccentricity or distance between the axes is adjustable automatically or by hand. A scale and stop are provided for aiding the adjustment.

Interchangeable grinding spindles and spindle arms are furnished with each machine, in order to accommodate a large range of cylinder diameters. The grinding spindle runs in bronze bushings and ball bearings. The grinding wheel is held between two flanges which are centered on the grinding spindle by means of conical holes fitting a conical extension of the spindle. The grinding spindle is driven by means of intermediate pulleys which follow the eccentric motion of the spindle. Overhanging parts which might interfere with the accuracy of the grinding operation are not employed.

To make the work table absolutely true, it is finished by grinding after mounting on the machine. It is accurately adjustable, both vertically and laterally. Its stationary position during cutting aids in obtaining accuracy on the work.

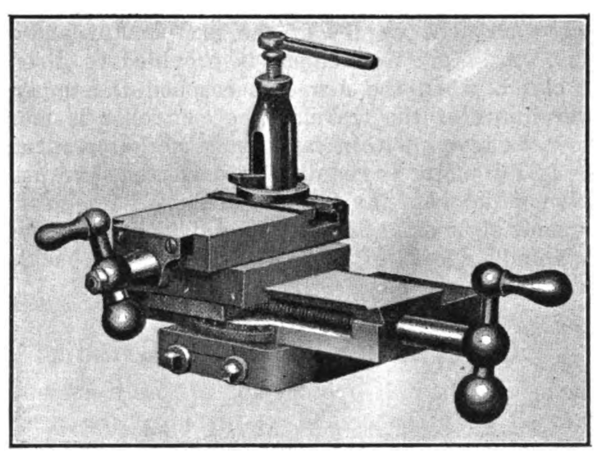
For the removal of grinding dust, an exhaust fan and flexible hose with suitable attachments are furnished with each machine. This thorough removal of the dust insures a better finish, and in addition protects nearby parts of the machine and also the operator. The exhaust air is taken to a coke filter, where the dust is retained.

The larger sizes of the machine are intended for use on cylinders of steam engines and such machines. It is stated that the results obtained on large cylinders are comparable in excellence to those obtained when grinding automotive cylinders. In order to give an idea of the wide range of sizes of the machine, a few specifications of the Nos. 2 and 7 sizes will be interesting. The maximum grinding diameters are 7 and 31½ in., respectively, and the maximum lengths of the ground surfaces 15¾ and 78 in. The work table sizes are 17¾ x 21⅝ in. and 78 x 118 in. respectively. The maximum movements of the grinding heads are 33½ and 106 in., and lateral adjustment of the table 15¾ in. for both sizes.

The heights of the grinding spindles above the floor are 39⅜ and 54 in., and the floor space 4½ x 9 ft. and 13 x 31¼ ft. Horsepower required, 4 and 25, respectively. The net weights are 3,750 and 70,000 lb., and the weights boxed, 4,200 and 75,000 lb. The countershafts weigh 200 and 1,100 lb. additional. The illustration shows Size 5, which grinds cylinders up to 12 in. in diameter and 44 in. long.

Milliken 11-Inch Slide Rest

An 11-in. slide rest for lathe use has just been brought out by the Milliken Machine Co., West Newton, Mass. The maker calls attention especially to the method of securing the rest to the base, as the rest can be swiveled or held firmly in position. A tapered hub on the rest fits in a tapered hole in the base, and a sliding segment is clamped by means of the two collar screws shown in the accompanying illustration.



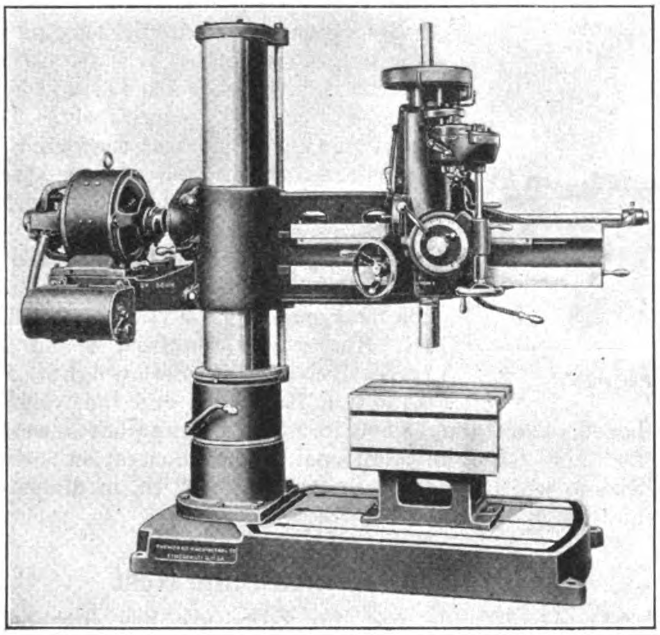
MILLIKEN 11-IN. SLIDE REST

The feed screws have 10-pitch square threads. The swivel is graduated, and a standard toolpost is provided. All bearing surfaces are scraped, and the rest is finished all over. A lateral travel of 5¾ in. is provided; also a cross travel of 2½ inches.

Motor-on-Arm Drive for Morris Radial Drilling Machine

The accompanying illustration shows a drive arrangement with the motor mounted on an extension at the back of the swinging arm, that has recently been applied by the Morris Machine Tool Co., Court and Harriett Sts., Cincinnati, Ohio, to its radial drilling machines.

The location of the motor serves to balance the weight of the arm carrying the head. It is thus easier to raise and lower the arm on the column, so that the head can be positioned more rapidly than when it is not balanced. The elevating mechanism is mounted as a unit on the back of the arm near the motor drive gears, and is in operation only when the arm is being raised or lowered.



MORRIS RADIAL DRILLING MACHINE WITH DRIVING MOTOR MOUNTED ON EXTENSION OF ARM

The vertical screw is stationary. The revolving unit is bronze and mounted on ball thrust bearings that can easily carry the weight of the arm, motor and other parts. A safety mechanism is provided to disengage the clutch when the arm has reached the upper and lower limits of the travel. The controller is mounted below the motor within easy reach of the operator.

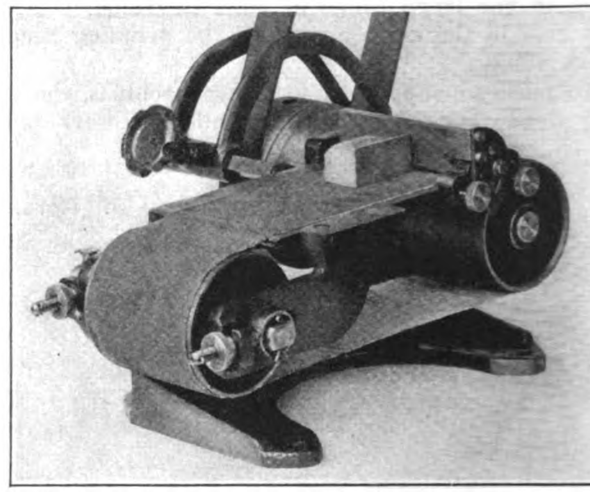
A 3½-hp. motor is required to drive the machine here shown, which is of the 4- and 4½-ft. size. The head is of the same style as on the standard drilling machine, and has spindle speeds of 26 to 450 r.p.m. The back gears and clutches are nickel steel.

Coats Bench-Type Belt Grinder

A bench-type belt grinder for finishing flat surfaces on small metal parts and castings has recently been placed on the market by the Coats Machine Tool Co., Inc., 110 West 40th St., New York, N. Y.

The machine carries a jointless woven belt or band of abrasive material 4 in. wide and 36 in. long that travels over a flat table 10 x 5½ in. in size. The grinder is more suitable to certain work than a disk grinder, as the speed of the entire abrasive belt is uniform and a greater surface is available. The bands wear evenly and can be easily replaced. For tensioning the belt, no jockey pulley is provided; but a positive motion of the front band pulley is obtained by means of two nuts.

The bearings are long and are guarded to make them dust-proof. They are fitted with screw-down lubricators. The main shaft runs in an oil-retaining bushing 6¾ in. long, which extends to the center of the driving pulley. The loose pulley is reduced in diameter, so that the strain on the driving belt is released when the machine is not running. It does not run on the spindle of the machine, but on a cast-iron sleeve extending from the base castings. The pulleys are 5½ in. in diameter and are driven by a 1½-in. belt, the speed ordinarily being from 500 to 1,000 r.p.m. A detachable, graduated rest or back-stop for the work is provided that can be swung through 45 deg. to either side. The approximate net weight of the machine is 60 pounds.



COATS BENCH-TYPE BELT GRINDER

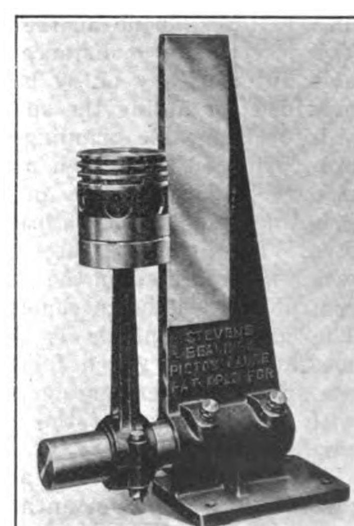
Stevens Piston Aligning Gage

The accompanying illustration shows a gage for use in aligning automotive pistons on their connecting rods. The device was recently brought out by Stevens and Co., 375 Broadway, New York, N. Y.

The device is intended for mounting on a bench. Any twist or bend in the connecting rod can be detected by fitting the large end of the rod on the arbor and placing the piston against either the edge or the flat side of the vertical straightedge. Deviation from the true position can be detected by the eye.

The device serves also for trial fitting the connecting-rod bearings on the crankshaft. It is not necessary to do the fitting at the motor itself, so that the work can be done at the bench.

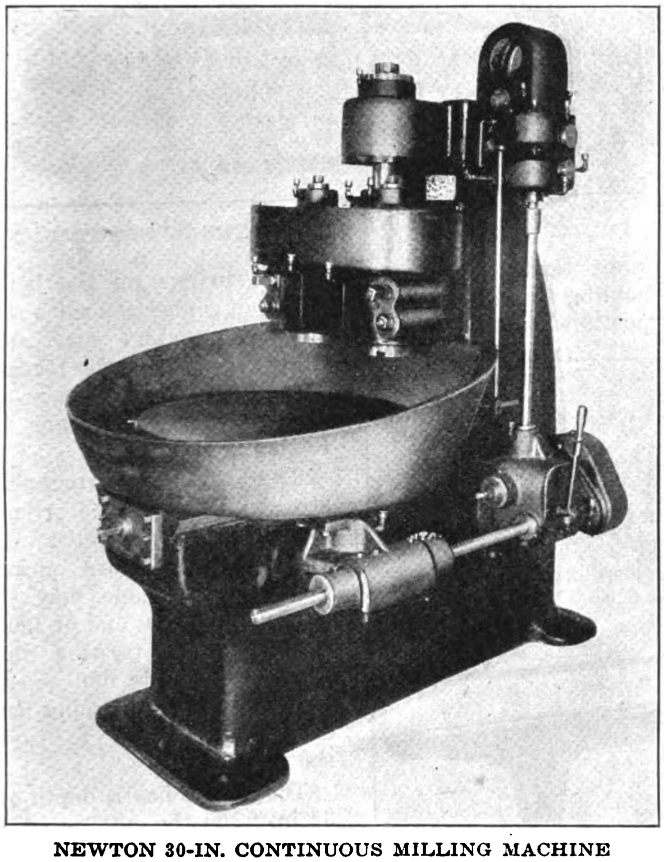
Arbors can be furnished for any size of bearing required. They weigh from 6 to 8 lb., depending on the size. The gage itself is 19 in. in height and weighs 19 pounds.



STEVENS PISTON GAGE

Newton 30-In. Continuous Milling Machine

A continuous milling machine of the rotary-table type that has recently been placed on the market by the Newton Machine Tool Works, Inc., of Philadelphia, Pa., is shown in the accompanying illustration. The machine is ordinarily equipped with two spindles mounted on the same head, although it can be supplied with but one spindle for special types of work. The tub or chip



NEWTON 30-IN. CONTINUOUS MILLING MACHINE

guard shown around the table is for use when coolant is employed. It is, of course, not necessary when cast iron is being machined.

The column and the bed of the machine are cast in one piece. The machine can be driven by a single pulley, or by a 7½-hp. motor running at 1,200 r.p.m., and mounted on top of the machine so as to be directly connected.

The height from the top of the table to the faces of the spindles can be varied from 4 to 12 in. The maximum distance from the center of the spindle to the center of the table is 18 in., and the minimum distance is 8½ in. when the tub is mounted, and 4½ in. without the tub.

The rotary table is carried on a circular saddle, so that its distance from the spindle can be easily adjusted. It can be rigidly locked in place after it has been located. The saddle contains the bearings for the table, and also the gears by which the table is rotated. The table is held in double bearings, the annular bearing being 28¾ in. in diameter. It has a solid top to which the jigs and fixtures for holding the work can be bolted. The rotary feed of the table is operated through a helical gear 24 in. in diameter, driven by means of a worm and worm wheel.

Two types of feed motions are provided for the table. The first one is continuous and used for ordinary continuous milling. In the other, an intermittent feed and rapid traverse are provided, the rapid traverse being 10⅝ times as fast as the feed for cutting. It is used when the surfaces to be machined are not close together, as when only small surfaces are to be finished on large pieces of work.

The clutch used for engaging and disengaging the feed provides a safety device to prevent breakage of the machine in case of jamming or over-loading. The feeds and speeds used can be varied by means of removable change gears. The spindles have No. 5 Morse tapers in the ends and keyways in the faces. They are driven by hardened steel gears that run in oil. The quills are 6½ in. in diameter and have 2-in. individual vertical adjustments for setting the height of the cutters.

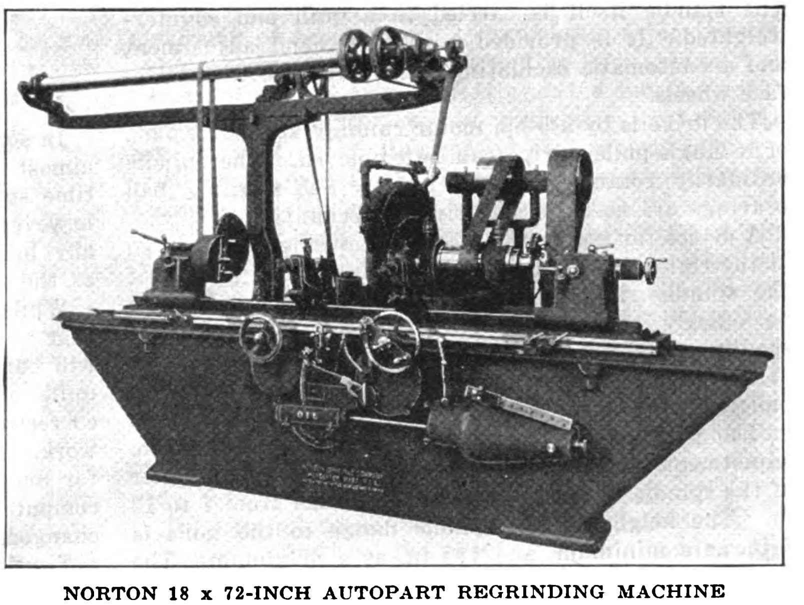
The slide carrying the spindles can be adjusted to suit the height of the work. Cutters up to 10 in. in diameter can be employed. The centers of the spindles are 13 in. apart and 10 in. from the upright. The overall height of the machine is 8 ft. The machine without the coolant tub requires a floor space of 74 x 38 in., and with the tub 81 x 54 inches.

Norton 18 x 72-Inch Autopart Regrinding Machine

The accompanying illustration shows an 18 x 72-in. size of the autopart regrinding machine that is made by the Norton Co. of Worcester, Mass. This machine provides a greater capacity than the standard 18 x 55-in. machine, so that it is applicable to a greater variety of work.

In order to fit the machine to general use a power-driven table traverse mechanism is incorporated. The machine is arranged for drive by belt from a lineshaft or from a motor placed in the rear of the machine. The machine is thus self-contained. It can be adapted to all sorts of cylindrical grinding.

The dimensions of the wheelslide, headstock, footstock and other principal members of the machine are the same as on the corresponding parts of the standard 18 x 55-in. autopart regrinding machine.

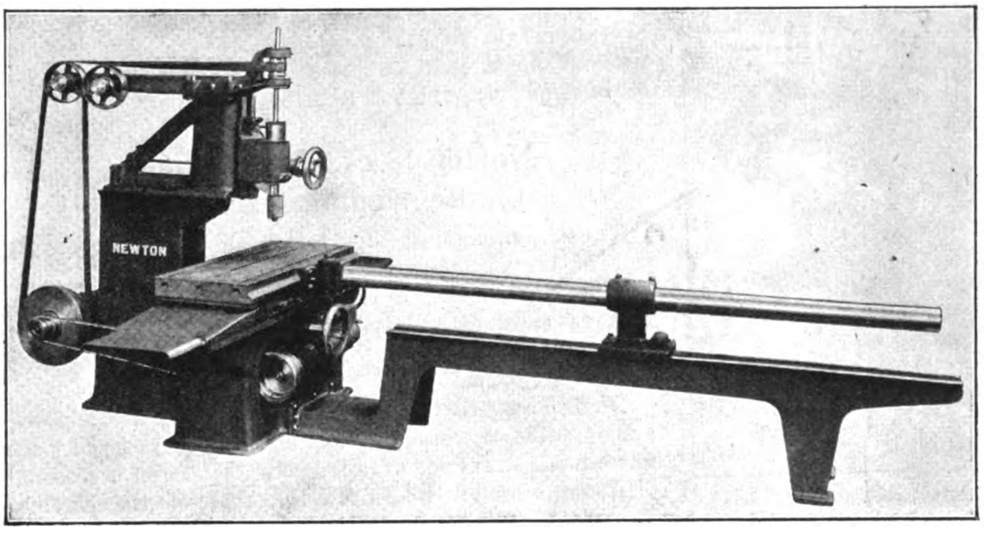


NORTON 18 x 72-INCH AUTOPART REGRINDING MACHINE

Newton Radius Link Grinding Machine

A radius grinding machine that is intended particularly for finishing the reverse links and blocks used on locomotives has recently been placed on the market by the Newton Machine Tool Works, Inc., Philadelphia, Pa. The base is a box-type casting, to the front of which is secured the radius arm support, and to the back the column. The arrangement of the parts, particularly of the radius bar, can be seen in the accompanying illustration. This bar is a tube 4 in. in diameter, and has its outer end supported on a slide, so that the length of the radius can be easily adjusted by means of a rack and pinion, and read on a scale on the slide. The radius can be varied from 18 to 100 inches.

The table has hand adjustment and is reciprocated automatically by the use of dogs. Three speeds are provided. The maximum stroke of the table is 30 in., and the minimum 2 in. There is a dwell at the end of each stroke, so as to give time for operating the vertical feed. Cast-iron shields prevent the bearings from becoming uncovered at the ends of the stroke. The table is 18 x 42 in. in size.



NEWTON RADIUS LINK GRINDING MACHINE

The spindle head is adjustable on the upright to suit the depth of cut and the position of the work. The spindle itself is carried in a quill and counterweighted. It is provided with both hand adjustment and an automatic oscillating motion for use with wide-face wheels.

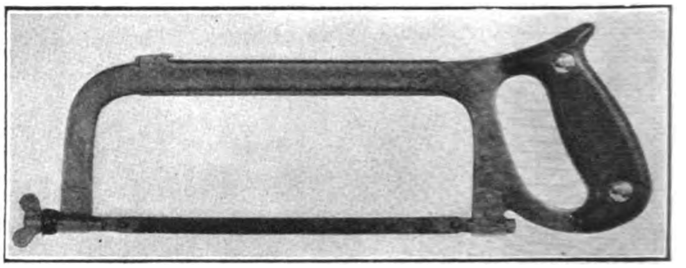
The drive is by a 5-hp. motor running at 1,200 r.p.m., or a single-pulley drive can be employed. The spindle ordinarily rotates at 6,000 r.p.m. Self-aligning ball bearings are used in the driving mechanism.

A device for truing the wheel is conveniently mounted at the right side of the spindle. The vertical motion of the spindle slide is used, so that the operation can be quickly performed. The diamond holder can be readily moved out of position when not in use.

The spindle runs on ball bearings, and the driving pulley is carried on separate bearings, so that there is no belt pull directly on the spindle. The quill has 3 in. adjustment in the slide. The distance from the center of the spindle to the column can be varied from 7 to 13 in. The height of the spindle flange to the table is 7 in. as a minimum, and 18⅜ in. as a maximum. The floor space occupied by the machine is 14 ft. 3 in. x 9 ft. 6 in., and the height overall is 6 ft. 7½ inches.

Starrett Pistol-Grip Adjustable Hacksaw Frame

The L. S. Starrett Co., of Athol, Mass., has just brought out the pistol-grip hacksaw frame No. 169 that is shown in the accompanying illustration. Constant tension is maintained by springs on the bolts holding the blade. This feature, in connection with the positive adjustment on the back, enables easy and rapid changing of the blades. The pawl for adjustment is set down inside the frame as low as possible.



STARRETT PISTOL-GRIP HACKSAW FRAME

The back is constructed of steel tubing which is strong enough to prevent buckling. All steel parts are nickel plated. The blade may be set to cut in any one of four directions by turning the wing nut. It is not necessary to remove the wing nut entirely in order to turn the saw.

The frame has a depth of 3⅜ in. from the cutting edge of the blade. The adjustment permits the use of blades from 8 to 12 in. in length. The hard rubber, checked handle provides plenty of finger room and gives a comfortable grip for the operator. The device is well balanced, so that it can be easily and rapidly operated.

The Importance of Timekeeping

By A. W. Brown

In some industries, iron founding for example, it was almost impossible to persuade employees to record the time spent on piecework. The reason for such record, however, which should have been obvious, was eventually brought home to many of the employers as well as the workers.

While the purchasing power of a dollar varies from year to year—as all of you have noticed—there always will be just sixty minutes in an hour. If only money units are recorded, they will be useless later on for correctly estimating the cost of the same or similar work. But if the hours and minutes spent on a job for one year are recorded, their value may readily be computed at the new time rate, if the rate has been changed.

Timekeeping on all kinds of work also facilitates the correct estimation of possible delivery time, which is often of prime importance in making out orders.

Semi-Annual Meeting of the Society of Automotive Engineers

White Sulphur Springs Scene of Large Gathering—Good Technical Program—Sports, Dancing and Motion Pictures Feature Entertainment Arrangements

AN ENCOURAGING feature of the semi-annual meeting of the Society of Automotive Engineers at White Sulphur Springs was the attendance, which exceeded committee estimates by more than twenty per cent. Probably the time of year, June 20 to 24, and the fact that White Sulphur is about equally distant from the principal automotive centers had something to do with it. Most of the old guard were on hand, as usual, and many members brought their wives and daughters.

The council met on Monday and the special trains from the East and West brought in the members on Tuesday morning in plenty of time for the opening of the Standards Committee meeting at ten o'clock. E. A. Johnston, chairman of that committee, presided at both morning and afternoon sessions, at which were presented reports from the following divisions: Agricultural Power Equipment, Axle and Wheel, Electrical Equipment, Engine, Iron and Steel, Lighting, Non-Ferrous Metals, Parts and Fittings, Passenger-car Body, Screw Threads, Springs and Stationary Engines.

Most of the reports were approved, both by the committee and by the society at its business meeting in the evening, but some few were amended or referred back for future consideration. Those accepted must be approved by letter ballot of the whole society.

Numbering Engines and Cars

A feature of this meeting, of interest as well to manufacturers of other kinds of machinery, was a report from a sub-committee on methods of numbering engines and cars so that obliteration or change of the numbers would be impossible without easy detection. The committee had had samples made up to test several of the most promising suggestions, but admitted that it had been somewhat taken back by the ease with which all of them had been beaten by the Underwriter's Laboratories. One of the difficult problems to be considered is the existence of some ten million cars now on the road, numbered by all sorts of haphazard methods, and how to apply any new system to them.

In connection with a recommendation limiting the clear opening of the crankcase drain to $\frac{3}{4}$ in. discussion developed which brought out the sense of the meeting that such a move would be an incursion into the field of design, which would be a bad precedent and possibly harmful to the standardization movement.

Instead of the usual dry formality that is apt to accompany business meetings, this one was marked by a lively interchange of opinion on qualifications of engineers and requirements for admission to the S. A. E. President Bachman made an excellent address in which he called attention to the advisability of opening the roster of the society to operation and maintenance men as well as to designers and producers. He commented on the effect of the business depression on the membership and on the income of the society, and also on the industry in that three new types of vehicle had arisen in the speed wagon, motor bus and railroad motor car. In closing he pointed out the increasing seriousness of the urban traffic problem and urged that careful thought be devoted to aiding traffic administrators in its solution.

A message from Secretary of Commerce Hoover offering the aid of his Division of Simplified Practice to the S. A. E. in securing the adoption of their standards was presented by R. M. Hudson of the division. It was received with enthusiasm by those members of the Standards Committee who heard it.

American Spirit Leads the World

Mr. Hudson said: "When it comes to sizing up a situation, deciding what needs to be done, and then doing it, we Americans like to believe we lead the world. As a national characteristic, we pride ourselves on our ability to get results, and to get action when action counts most. It's *that* spirit, or 'pep,' which has developed our industries, broadened our markets, increased our national wealth, raised our standard of living, and given us many of the opportunities, advantages, and pleasures of the present day. We've been so busy pushing ahead we've not taken time to look back, nor to 'check up'—consequently, when the committee from the Federated American Engineering Societies presented its report on 'Waste in Industry,' it gave us a jolt! Prior to the war we had considered our industries highly efficient, and so they were. With their automatic machinery, their progressive manufacturing methods, their utilization of byproducts, and all the other illustrations of efficient operation, it seemed as though the maximum advance had been made. Then the World War forced us to conserve our materials, our labor, and our other resources, and to concentrate our energies on the big job of winning. Under the stress of war conditions, greater advances were made in industry. Again we felt we had reached a maximum of achievement. The one big thing brought out by the engineers' report is that we have only started, the job is a long, long, way from being finished! The facts revealed in the assay of waste serve as a foundation for the further advancement of American industry.

"When Herbert Hoover came into the position he now occupies, he immediately proceeded to get action in truly characteristic manner. You are all familiar with his activities in the President's Unemployment Conference, the study of business cycles, the super-power project, the Colorado River development, the present coal strike, and many other matters of current interest. They all bear on his one great aim which combines the elimination of waste in industry, the preservation of the high standards of American living, and the maintenance of that great principle of American individualism.

"His secondary objective is that the Department of Commerce shall be the worthy servant and representative of American business, and a true interpreter of industries' needs. The entire organization of his department has been revamped and changed until it is

now rapidly taking form as a great 'service-rendering' body whose value to American business men is becoming increasingly evident. Our Bureau of Foreign and Domestic Commerce is helping to broaden the markets for our goods; our Bureau of the Census has developed a statistical service carrying live information on the trends of current business to executives, who in turn, are regulating the activities of their individual enterprises in accord with the relative opportunities shown. Our Bureau of Standards is co-operating with many industries in highly technical research work, leading to the solution of important scientific problems.

"In the Division of Simplified Commercial Practice (so-called because we feel it has a more psychological approach to the lay mind than does the word 'standardization'), we are co-operating with many industries in the establishment of those elementary standardizations of nomenclature, grade, and size which make for greater economy in production, distribution, use, and maintenance of our common commodities. You may consider, if you wish, that we are carrying on those eliminations of excess variety, and simplifications of process, inaugurated by the conservation division of the War Industries Board. Many of you had a part in that work, and will recall how, at first, it seemed there would be a stoppage of all progress, and a suppression of all individuality in design, and style, if manufacturers of a specific line were forced to reduce the varieties in their products. But when the representatives of the industry met with those of the Government, and the necessity for the maximum concentration of our resources was demonstrated, 'excess variety' became a target for concerted action. There resulted many eliminations in agricultural implements, horse-drawn vehicles, road-making machinery, bicycles, stoves, furniture, refrigerators, garments, shoes, and 101 other articles of every-day usage. The most skeptical among the manufacturers, distributors, and even consumers, found that the resulting advantages to them were greater than they realized were possible. They all gained, in relative degrees.

"When the armistice was signed, a sufficient community of interest had sprung up among manufacturers to warrant further efforts toward simplification. The United States Chamber of Commerce, through its Fabricated Production Department, has been, and is now, devoting its energies to educational work designed to increase the appreciation of the American public for the real values of standardization.

Progress of Simplification

"Recently Secretary Hoover requested the American Engineering Standards Committee to canvass the various technical bodies for their suggestions as to what simplification in manufactured products is most needed and most desired. In this way, every industry will be reached, and the summary report of industry to the Secretary (by way of the American Engineering Standards Committee) will be acted on by, and through, our Division of Simplified Practice. We are now in contact with over seventy-five industries, through their trade associations. We have completed certain simplifications in some of them; surveys are under way in others; and committees are being formed, or considered, in still others for the purpose of working out those simplifications, which each industry as a unit regards as of greatest advantage to it. It is entirely a voluntary matter on the part of industry; there is nothing of government dictation, regulation, or supervision in it. We're here to help those who want us to help them! We make no claim of technical knowledge in the specific industry with which we may be working at the time, but we do have resources, contacts, and connections, which enable the Department of Commerce to render some highly effective assistance, when it is asked to do so. Our division is mainly a co-ordinating unit.

"We seek to bring together the commercial and the technical groups interested in a certain elimination, or simplification, and then, when a unanimous recommendation has been produced, the Department of Commerce adopts it, and publishes it as its own. These 'Simplified Practice Recommendations,' which recognize the several elements contributing to their development, are broadcast in pamphlet form. It is expected that, through their wide distribution, and through follow-up of the application of these recommendations to commercial practice, there will be obtained a much greater support and adoption of the best thought and practice of the industry.

Continue Standardization

"As for the exact application of our service to the automotive industry, Secretary Hoover has a high regard for the pioneer work done by the S. A. E. in educating the automotive manufacturers, also the distributors and users of their products, to their present high regard for standardization. He is, however, looking to your society to continue your efforts beyond the technical and commercial advantages into the economic phases of the subject. Not only is the broader application of the principle of paramount importance in the restoration of prosperity and the solution of many of our current domestic problems, but it is vital to the successful meeting of foreign competition. Many foreign countries are carrying on standardization activities, and these, coupled with the low wage of native labor, and its willingness to work long hours, mean American business men should act quickly to eliminate waste, adopt and apply standards, and in the broadest sense possible, conserve their resources to the end that this country can maintain its position."

On Wednesday morning two simultaneous sessions were held, a motorbus and an aëronautic session. The relative interest in the two topics was shown by the very small attendance at the aëronautic session. Some unusually interesting army motion pictures were shown at the end of this session. They served to attract about five times as many members as did the excellent papers presented.

J. V. Whitbeck presided at this session. The speakers and their subjects included: "Overhead Camshaft Passenger-Car Engines," by P. M. Heldt; "A New System of Spring Suspension for Automotive Vehicles," by H. M. Crane; "The Automotive Engineer and Our Service Problems," by F. A. Bonham.

The Thursday session was devoted to research. Considerable interest attached to the report of Dr. H. C. Dickinson, research director of the S. A. E., as he made several very plain statements. Passenger cars were discussed on Friday, and fuel and engines on Saturday.

At the fuel and engine session the papers presented were: "The Hot-Spot Method of Fuel Preparation," by F. C. Mock and M. E. Chandler; "Detonation Characteristics of Some Blended Motor Fuels," by Thomas Midgley, Jr. and T. A. Boyd; "Oil Pumping," by G. A. Round; and "Oil Consumption," by A. A. Bull.

News Section

Freight Loadings and Repairs

Loading of revenue freight during the week which ended on June 10 totaled 846,002 cars, compared with 750,645 cars during the previous week, or an increase of 95,357 cars, according to reports just received from the railroads of the United States by the Car Service Division of the American Railway Association. This increase was largely due to the fact that the previous week included the Decoration Day holiday. There was an increase, however, of 24,871 cars compared with the week before the holiday. The loading for the week of June 10 also came within 33 cars of the largest loading for any week this year preceding the coal strike.

Compared with the corresponding week last year, there was an increase of 58,719 cars, but compared with the corresponding week in 1920, the total for the week of June 10 represented a decrease of 84,974 cars.

Freight cars idle on American railroads because of business conditions on June 8 totaled 465,837 as compared with 480,266 on May 31, or a decrease of 14,429 cars.

Of the total, 284,189 were surplus freight cars, while the remaining 181,648 were freight cars in bad order in excess of the normal number unfit for service.

Of the 2,273,924 freight cars on line, reports showed 340,822 or 15 per cent to be in need of repairs compared with 334,108 or 14.7 per cent on May 15, an increase of 6,714. Allowing 7 per cent as representing the normal number in need of repairs would leave 181,648 as the number in bad order and idle because of business conditions.

Southern Metal Trades Holds Convention

The fifth annual convention of the Southern Metal Trades Association, was held at Savannah, Ga., June 19 to 20, with a large attendance of members from every southern state. Despite the unfavorable conditions prevailing for the past year and a half, the consensus of opinion among the delegates seemed to be that the industry had weathered the storm of business depression in a manner most satisfactory. That the turning point is now at hand and that business is rapidly on the upward grade, was the general feeling of those present. By the end of the present year as compared with pre-war times, a majority of the foundry and machine shop operators anticipate fairly normal conditions.

Headquarters of the convention were at the Savannah Hotel. The first day, Monday, was given over to reports of officers, appointment of committees, discussion of business conditions and the outlook, and addresses on important subjects of interest to the metal trades. Among the speakers Monday was Horace Lanier, president of the West Point Iron Works, West Point, Ga.; Gus F. Meehan, president of the association; William E. Dunn, Jr., and J. W. Moore, secretary and treasurer of the association respectively; T. M. Cunningham, Jr., president of the Chatham Savings and Loan Co., Savannah, and Patrick Dwyer, editor of *Foundry*.

The following officers were elected for the ensuing year: J. H. Dore, Houston, Tex., president; J. R. Hedges, Chattanooga, Tenn., vice-president; W. E. Dunn, Jr., Atlanta, secretary; J. W. Moore, East Point, Ga., treasurer.

The 1923 annual meeting will be held at Memphis, Tenn.

Joint Committee to Consider Automotive Standards

A joint committee has been appointed by the Society of Automotive Engineers and the National Automobile Chamber of Commerce to take up with the Division of Simplified Practice of the Department of Commerce the question of wider adoption of S. A. E. standards. The S. A. E. members are J. G. Vincent, W. G. Wall, F. E. Moskovics, C. M. Manly and C. F. Kettering. Mr. Moskovics also represents the N. A. C. C. which has appointed in addition D. C. Fenner, Salisbury and M. K. Pulcher. Those members of the joint committee who were present at the beginning of the S. A. E. summer meeting at White Sulphur Springs, had a conference with Secretary Hoover's representative, M. R. M. Hudson. A start will be made on tires, rims, bearings and spark plugs.

Problems of the Steel Worker Discussed

The American Society for Steel Treating, New York Chapter, considered chiefly the problems that confront the worker, at its June 21 meeting in the Woolworth Building. A. H. Kingsbury, of the Crucible Steel Co. of America, spoke on the troubles that are encountered in handling tool steel. He said that great progress is being made in the art of making and treating tool steel, and that the exchanging of data as now practiced is accomplishing a great deal of good. Mr. Kingsbury called attention especially to the desirable properties of tungsten steels for tools. The factors entering into the problem of making good tools, and methods of overcoming the numerous difficulties were taken up.

Molten salt baths for use in carburizing were discussed both broadly and in detail by Sam Tour, metallurgist of the Doehler Die Casting Co., of Brooklyn. Mr. Tour told of investigations made in a search for the best salt bath, and he gave the data and properties of a number of baths. The commercial salt baths and other less known baths were discussed, the conclusion being, however, that there is still much to be desired in the properties of the baths now available.

Engineering Educators Plan Greater Activity

The necessity for a new and broader vision of engineering education, based on the requirements and demands of industry, was outlined by the president, Prof. Chas. F. Scott, of Yale University, at the annual convention of the Society for the Promotion of Engineering Education held last week in the University of Illinois in Chicago.

Resolutions were adopted for enlarging the scope and the securing of funds to carry on the work on a broader scale. A committee of five members, including the president, was appointed to study the development of the society and to formulate an answer to the question, "What can the society do in a comprehensive way to develop and enrich engineering education?" The keynote of the discussions at all sessions was the development of teachers who can train engineers, with analyses of plans that are now being studied to make university training more effective.

At the conclusion of the convention, the following officers were elected for the ensuing year: Chas. F. Scott, Yale, president; D. S. Kimball, Cornell, and F. G. Higbee, Iowa, vice-president.

Committee To Study Friction Bearings

The Chief of Ordnance has appointed a committee to conduct a series of tests on anti-friction bearings both in the Bureau of Standards and in service stations. Col. Stayer, of the Ordnance Corps, is chairman of the committee and the members are Messrs. Runge and Brunner, respectively vice-president and chief engineer of S. K. F. Industries, Inc., Mr. Snyder of the Dixon Crucible Co., and Mr. Ungar, consulting engineer. The tests will extend over a year and will cover comparative service and endurance tests on ball and roller bearings and on lubricants prepared for use with anti-friction bearings. They are intended to be essentially practical in nature and scope.

Increase in Automobile Production

Figures received by the Department of Commerce show a very large increase in May in the production of passenger automobiles and trucks. The total production of passenger cars in May, so far reported, amounted to 231,699, compared to 197,221 in April. This is an increase of nearly 18 per cent.

The total truck production in May was 24,603 machines.

Reports have been received this month from a number of companies which have not reported previously. This has necessitated a revision of the figures for earlier months. For the month of May 91 companies have reported on passenger-car production and 82 companies on trucks.

Business Conditions in England

By OUR LONDON CORRESPONDENT

After a lockout of fourteen weeks duration, the Amalgamated Engineering Union has voted to accept the employer's proposals—and an early resumption of industrial activity seems now in sight. While some doubt is entertained in certain quarters, it is generally hoped that the return of the employees to work will come in time to rescue, to some extent, a season which, a few months ago, gave promise of being a very successful one.

The effect of the lockout and its monetary loss to industry is difficult to estimate. Certain electrical engineers are today complaining of a marked decrease in orders as a result of the inactivity. In the automobile industry, more especially in the lighter branches, in which the early prospects seemed particularly bright, there has been a marked falling off in orders. Shipbuilding costs are still held to be prohibitive.

German Imports

The machine tool trade shows little change. While a fair number of machine tools have been exported, the relatively few imports of this character have been mainly from Germany. In a recent month that country sent in 140 tons out of a total of 259 tons. The United States accounted for a little over 50 tons and France for less than 40 tons. Although German tools are coming into the country, it is difficult to discover accurately to whom they are actually being sold. To a large extent they are being hawked about by relatively small men. That the prices are low may be gathered from the fact that a month or so ago drilling machines imported from Germany as compared with those coming from the United States were approximately equal in money value, although the total weight of the German tools was seven times that of the American tools. This is, perhaps, an exceptional case but it does not stand alone altogether.

The coal industry generally has been on the up grade. Wages paid, however, have fallen, in many instances, below what can be regarded as a reasonable level in these times. The output, nevertheless, is moving upwards and is definitely beyond the corresponding figure for last year. Foreign markets are being recovered rapidly, including certain ones that were thought to have been lost. With a revival in home industry prospects would be entirely satisfactory, as it has been admitted that the workmen, generally, are working hard with increasing output. Apart from wages, there is the handicap resulting from high prices for coal as delivered to the consumer. The high price of coal is regarded as about the main reason for the collapse of the tin-mining industry in Cornwall, where not a single tin mine is working. Generally speaking, it is felt that the production side of the coal industry is being run at a loss, despite low wages being paid. A return to the 8-hour day has been suggested, and it is claimed that this would reduce the price of coal by 2s. 6d. a ton. A better remedy, perhaps, would result from a thorough examination into the methods and costs of distribution. The South Wales district especially has been cited as a case in point on the ground that the output there has reached 1,100,000 tons a week, as compared with 1,250,000 tons in the record year of 1913. Despite this showing, however, the business has not been profitable as is seen from the auditor's certificate just issued for the coal trade of this area for April showing a total deficit of more than £316,000.

That industrial conditions, on the whole show improvement is indicated by the unemployment returns, the figures recently published showing a reduction for the year of 309,500. The total number of unemployed workers—men, women, boys and girls—is stated, at the present time, to be 1,514,200. The number of workers on short time and drawing benefit for intervals of unemployment also shows a marked reduction, the latest figure being 120,000.

It is hoped that the reduction of the income tax by 16 per cent will do much to stimulate trade. Even with this reduction the tax is held to be the major handicap on enterprise, and the demands of the tax gatherer are certainly detrimental to expansion. On the other hand, doubt is expressed as to the wisdom of the present reduction, it being maintained that the Chancellor of the Exchequer is taking more or less risk. The slight reduction in postal rates may furnish some relief. Figures for the cost of living show still further declines, being now 81 per cent above pre-war rates. For a time they will probably be stationary at or near that figure, as the wholesale price tendency has been to increase very slightly.

Government Credit

The government is lending such assistance as it can, as evidenced by the credit of £3,000,000 granted to Portugal by the export credit department of the board of trade. According to the conditions of the loan the funds must be applied exclusively to the purchase in England from English firms of goods produced or manufactured wholly or in part within the United Kingdom. Articles of luxury, arms and munitions, generally, are not included in the terms. Although under the conditions English firms and payment in England are mentioned exclusively, doubtless Great Britain and British firms are really meant.

Conditions in Norway are regarded as showing improvement, reports stating that certain stocks have been absorbed and credit thus relieved, so that with an improvement in the currency situation an increase in the volume of business between the two countries is anticipated.

The Safeguarding of Industries Act, by which a duty of 33⅓ per cent has been imposed on a considerable number of imported articles, largely chemicals, has proved to be full of absurdities, nothing being more ridiculous than the means employed to obtain the return of money wrongly paid as duty. In the course of the operation of the Act, customs officials have levied a duty on a number of articles which, it has been held, should not have been placed on the list. Nevertheless, the duty has been paid and the officials have refused to refund it. Merchants, therefore, have been compelled to re-export such goods to a convenient continental port, claim the drawback provided for by the Act, and then re-import the goods free of duty.

Interference Methods in Precision Gages

Precision gages are used in the shops as reference end standards for checking micrometers and other measuring instruments, and also as distance pieces or size blocks for precise mechanical work. The extensive use of precision gages necessitated by the small tolerances allowed in the manufacture of interchangeable machine parts, has required more accurately determined end standards and more rapid and precise methods for comparing gages with these standards than have previously been available. Since comparisons of end standards with line standards by means of micrometer-microscopes and of precision gages with end standards by means of contact instruments are subject to appreciable errors, methods which make use of the interference of light waves have been used by the Bureau of Standards in making these measurements.

Scientific Paper No. 436 of the Bureau of Standards has been prepared and describes interference methods by which the planeness and parallelism errors of precision surfaces can be measured, and the length of standard gages can be determined by direct comparison with the standard light waves with an uncertainty of not more than a few millionths of an inch. The errors of other gages can be determined by comparison with these calibrated standards with equal precision. The process makes the standard light waves, which have been determined to 1 part in 4 or 5 million relative to the international meter, the standards for this work. The paper may be obtained from the Government Printing Office, Washington, D. C., at ten cents a copy.

Dornbirer Gives Machine to Alma Mater

Rose Polytechnic Institute, at Terre Haute, Ind., has received its first gift for the new institution, which is being completed east of that city. It is a Cleveland open side planer and will be the center-piece of all other machinery installed in the new building. The machine is the gift of J. C. Dornbirer, machine tool manufacturer of Cleveland, Ohio.

At the age of twenty-nine, Mr. Dornbirer went to Terre Haute to attend Rose. He spent two years in school before branching out as a manufacturer. Dr. Philip Woodworth, president of Rose, voiced his deep appreciation and the gratitude of the institution.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

A report of the Federal Income Tax Bureau giving the individual incomes returned from 1914 to 1920 was published last week. I cannot do more than advert to them in this letter but the figures are so important that I have prepared an exhaustive analysis of them that I shall be glad to send gratis to those who may write me at 16 Exchange Place, New York.

Briefly they show that within three years the number of those having incomes of as much as $100,000 or more has been nearly halved. On the other hand the number of those reporting incomes of from $1,000 to $3,000 increased from 2,479,465 in 1917 to 5,241,266 in 1920, in which year there were 7,259,944 persons in the United States who reported incomes of $1,000 or more. Of these 33 had incomes of $1,000,000 or more, 3,649 had incomes of $100,000 or more and only 226,120 had incomes of $10,000 or more.

Industry Gaining

It is hard to believe that the larger incomes are so few in number, but if the returns reflect the facts the rich are no longer growing richer and the poor poorer as was formerly asserted.

The reasons for the change cannot be here discussed, but one result is likely to be an increased demand for the inexpensive staples and necessaries that are bought by people of small incomes and a restricted sale of the luxuries and superfluities formerly purchased by the rich.

The record of the week bespeaks continued gain in commercial and industrial activity. Bradstreet's and Dun's reports of last week agreed that business sentiment is cheerful and trade and industry are better situated than for nearly two years. The Social Service Bureau in Detroit announced that "well paid jobs for 400 men are going begging" and from all over the country a growing scarcity of labor is reported.

Charcoal iron is $1 higher at $26.50 per ton as compared with $22 two months ago, and Birmingham pig is up to $20 a ton. The steel mills are all busy and in the Youngstown district they are working up to maximum capacity to supply the demand from the automobile makers. Ingot production for the whole country is now at the rate of 39,000,000 tons annually as compared with 20,000,000 tons last December. Even copper, the laggard among the metals, is firmer though still for sale at slightly under 14 cents. The paper industry is operating at capacity and lumber of all sorts is again higher.

The sugar refineries are exceptionally busy. The domestic as well as the export demand is unusually large and refined sugar is up to 6.30, with every prospect of higher prices. The cotton goods market has been very active. It is estimated that 300,000 pieces of print cloth were sold in New York during the first three days of last week and the distribution in other lines was relatively as large. Raw cotton has been firm and the whole world seems imbued with the belief that it will be a season of very high priced cotton, although crop reports are slightly better and a prominent South Carolina planter has announced that by using a mixture of molasses and arsenate of lime he has conquered the boll weevil.

The New England textile strike is practically over with. The advance in wool seems to be halted but more woolen goods than are for sale appear to be wanted. Crude rubber is firmer and slightly higher, which is not surprising when the demand for tires is considered. Railroad officials are looking for a large increase in freight traffic after July 1 and many railroad consolidations are being talked of, including one that will take in the "Clover Leaf," the Western Maryland, the Wheeling and Lake Erie, and the Buffalo, Rochester & Pittsburg.

The New York and Boston Federal Reserve Banks have reduced their rediscount rate to 4 per cent and it is expected that the other banks will soon follow their example. The reserve ratio is 79.1 per cent as against 77.4 a week ago, and the gold on hand is increased by $12,000,000. Call money has averaged about 2¾ per cent, and 4 per cent is the rate for commercial paper and time loans.

Contemplating such a roseate outlook it is somewhat surprising that speculation should have suddenly become lethargic. But it is summer time and there are many who believe that the improvement in general business was discounted by the advance in stocks occurring prior to the first of June and that the bond market has been "fed up" with new issues that will have to be digested before a fresh appetite will be felt. This is probably true, but unless something untoward occurs before the harvest season ends a fresh upward movement on the Stock Exchange in which railway securities are likely to lead seems likely.

Coal Strike Serious

The repressive factors at present include not only the unsettled coal strike but a vaguely threatened strike of the railway operatives whose wages have been reduced by the Labor Board. The well informed regard the latter as almost impossible but its possibility breeds caution and it must be admitted that the continuance of the coal strike is creating a situation that will become grave unless it is soon ended.

A scarcity of coal is already felt in some directions and as we are not far away from the time at which the winter's supply would normally be accumulated there is reason to expect trouble unless full production is resumed by the first of August. The present hope of consumers is that the non-union mines can supply the demand if they are worked to full capacity but this is very doubtful and the need of effective intervention in the settlement of the dispute is becoming increasingly evident. The Geological Survey reports that reserve stocks of bituminous are now down to 26,000,000 tons, which is within about a week's consumption of the official danger mark of 20,000,000 tons.

Another somewhat disturbing feature is the low price of wheat, which is said to be inciting a holding movement among the farmers that would tie up much money and restrict the autumnal liquidation of agricultural debts to which the country's business is adjusted and accustomed.

Improved Foreign Outlook

The fumbling at Washington with a tariff bill of which hardly anyone approves is another disconcerting influence but because the public have become somewhat accustomed to the ineptitude of Congress the effect is not quite as depressing as it might be and there is some hope that out of the delay a rational measure may be evolved.

From London there have come reports of an amicable interview between Lloyd George and Poincare which have been construed to mean that the French will shortly make it possible for the bankers to reconsider their decision and bring out a German loan. The market for foreign exchange advanced sharply upon this assumption but there is nothing official to confirm it, logical as it would be.

The reports of Lenin's complete incapacity are confirmed and denied, but the weight of evidence indicates his final passing as a political power in Russia.

The settlement of the Mexican debt agreed upon by the Lamont Committee and Huerta awaits Obregon's approval which some believe will be conditioned upon the recognition of his government at Washington. The news from Cuba indicates progress toward the re-establishment of normalcy and in China the military leaders on both sides seem to be talking rather than fighting. In so far as overseas conditions are concerned they seem to be improving in the Orient as well as in Europe. Though progress is slow, there are no new developments that are adverse to American business and with the exceptions above noted, there is nothing in sight to disturb business confidence in the present or future.

Pig Iron Prices

Pig iron sales in the Birmingham district during the third week of June, according to the report of the Southern Metal Trades Association, showed a price range of from $18 to $20 per ton. The greater portion of the tonnage sold for delivery during the latter part of the third quarter was at $19 per ton, with a price of $20 per ton base prevailing for the fourth quarter.

Washington Notes

By Paul Wooton

Criticism of secret formulas by which decisions are reached by the Internal Revenue Bureau in tax matters, based on letters from Ernest F. DuBrul, general manager of the National Machine Tool Builders Association of Cincinnati, has been made by Senator Pomerene of Ohio in the Senate, in a speech in which the Senator urged the creation of a Court of Internal Revenue Appeals. Mr. DuBral, in his correspondence with the Senator, points out that the revenue bureau uses three confidential formulas for determining various things in fixing income taxes, and that additional taxes have been levied thereon. He stated that the formulas should be made available to the public to determine the justness of the tax. Secretary Mellon of the Treasury, who was appealed to on the matter, justifies the secrecy on the ground that the comparatives used are drawn from returns filed by other taxpayers and that it is unlawful to reveal them. He states that no "hit or miss" policy is pursued, but that adjustments in income and invested capital are made upon the basis of principles defensible under the tax laws. To this Mr. DuBrul replied that as the formulas are used in determining what salaries should be paid to officials of companies, the absence of knowledge of the formula made it impossible for a taxpayer to check the correctness of the formula. In claiming that the formulas, by which the bureau measures salaries to determine whether or not they are excessive, should be made public, Senator Pomerene declared "there is secrecy about the administration of the Bureau which discredits it."

The Budget Bureau has asked Congress to pay $199 to the Empire Machinery and Supply Corporation of Norfolk, Va., for balance due on account of materials furnished in connection with construction operations at the Cape Charles quarantine station. The supplies consisted of plumbing and heating materials.

The Budget has also requested that the Public Health Service be allowed to use $50,000 already appropriated for the West Roxbury, Mass., hospital, for constructing an auxiliary steam line.

Senator Willis, Ohio, has presented to the Senate a protest of the National Machine Tool Builders' Association of Cincinnati, E. F. DuBrul, general manager, against the recent action of the Senate in reducing the duty on machine tools from 35 to 15 per cent ad valorem. The petition also denies the statements of Senator Simmons of North Carolina, in the tariff debate that exorbitant profits are made by the machine tool manufacturers.

The deficiency appropriation bill reported to the House by the appropriations committee authorizes an appropriation of $271,000 for replacement of equipment and enlargement of the Capitol power plant to connect with the government printing office and the Washington city postoffice.

A correspondent is anxious to secure a copy of Chordal's letters by James W. See. Any reader having a copy to dispose of is requested to write to the editorial department of *American Machinist*.

Business Items

I. B. Williams and Sons, Dover, N. H., manufacturers of leather belting, announce the establishment of a new department of their business for the manufacture of mill strapping of all kinds. T. L. Chapman, for many years New England manager for the Deford Co., has been placed in charge of the new department.

The Worcester Machinery Co., machinery dealers, 86 Foster St., Worcester, Mass., will remove to its new location at 140 Commercial St., Worcester, on July 1.

The Barber-Colman Co., Rockford, Ill., manufacturer of cutting tools, has filed notice of a reduction in capital from $2,500,000 to $1,000,000.

The Pennsylvania Pump and Compressor Co., Easton, Pa., announces the opening of a branch sales office at 105 West Monroe St., Chicago, Ill., with H. M. Montgomery in charge.

The Star Foundry and Machine Co., Sharon, Pa., has taken over the plant of the Turner Fricke Manufacturing Co., of that city and will continue the production of gas engines and accessories.

The Master Trucks, Inc., 3122 South Wabash Ave., Chicago, Ill., manufacturer of motor trucks, has arranged for an increase in capital from $1,500,000 to $1,710,000 for expansion.

The American Car and Foundry Co., Terre Haute, Ind., is planning to reopen its local plant on July 5, following a shutdown for a number of months past. About 700 men will be employed, of which approximately 300 will be engaged in the repair departments.

The Fall River Sheet Metal Co., Fall River, Mass., has removed its plant from 247 Malden St., to 43 Fourth St., where facilities for increased production will be provided.

The Southern Dry Dock and Shipbuilding Co., Orange, Tex., will increase its working force to handle a contract for car repair and rebuilding work, recently secured from the Gulf Coast Railroad. About 200 men will be employed in this department.

The Buffalo Steel Car Co., Cheetowaca, N. Y., is arranging for a preferred stock issue of $1,000,000, a portion of the proceeds to be used for general expansion.

The Moline Plow Co., Moline, Ill., has arranged for a change in its corporate name to the Illinois-American Plow Co.

The Iron Products Corporation, which controls the Central Coal and Iron Co. and the Central Foundry Co., of Birmingham, Ala., announces the removal of its central sales offices from Chattanooga and Atlanta, to Birmingham. The change is effective immediately.

The American Bridge Co., New York City, has announced the removal from 30 Church St. to 71 Broadway, of the following departments: vice-president, chief engineer, eastern division contracting and treasury. The eastern division engineering, traffic and subcontract departments will remain at 30 Church St.

The Machinery Dealers, Inc., 453 Chapel street, New Haven, Conn., recently incorporated to deal in machinery, tools, etc., elected the following officers last week: W. E. Daley, president and treasurer; C. C. Sibley, secretary and assistant treasurer; directors, W. E. Daley, C. C. Sibley, and Arthur C. Bisgood, of Bridgeport, and E. M. Daley, of New Haven, Conn.

The Hartford Auto Parts Corp., Hartford, Conn., has been incorporated under the laws of Connecticut, with a capital stock of $430,000, to manufacture automotive machine parts, etc. The company will acquire the plant formerly owned by the Hartford Automotive Parts Co., Broad and Lawrence Sts., Hartford, which was recently sold at public auction to Robert C. Morris of New York, for $350,000. The incorporators of the new company are: Lucius F. Robinson; Lucius F. Robinson, Jr., and Frances E. Jones.

The Waterbury Standard Tool and Machine Co., Waterbury, Conn., has recently voted to dissolve the business and a certificate to that effect has been filed with the Secretary of the State of Connecticut. Harry B. Jenkins, 53 Euclid ave., Waterbury, has been appointed agent, and all claims should be forwarded to him.

The firm of Many & Mayer, Indianapolis, Ind., manufacturers of machinery for printing plants, has purchased a tract of ground on No. Ellsworth St., Indianapolis, where a new machine shop will be constructed in the future.

The Syracuse Sander Manufacturing Co., Inc., of Syracuse, N. Y., has filed notice of an increase in its capital stock from $10,000 to $50,000. The company makes special machinery and tools of various kinds.

The Electric Manufacturing Co., of Syracuse, N. Y., has been incorporated to make electrical machinery and devices. Incorporators are: Charles L. Amos, Florence B. Conway, and E. Merritt Larkin.

The E. Z. Car Control Corporation, Syracuse, N. Y., with a capital of $100,000, has been organized. William M. Lawyer, Franklin A. Lawyer and Albert C. Coon are the incorporators.

The Waterbury Farrel Foundry and Machine Co., Waterbury, Conn., it is announced, is completing an order for coining presses, rolling and punching machinery valued at $500,000, to be used in the new Shanghai mint. The work is being done under the supervision of Clifford Hewitt and his son, Harold, the former being the designer and builder of the U. S. Mint in Philadelphia.

The Fred C. Dickow Machinery Co., of Chicago, has removed to 2105 W. Lake St.

A portion of the No. 3 plant of the Wilson Foundry and Machine Co., at Pontiac, Mich., has been taken over by the Willys-Knight concern. The move was made to allow for expansion of the motor division.

The Willys-Overland plant at Poughkeepsie has been sold at a receivers' sale. Clement O. Miniger, of the Auto-Lite Corporation, was the purchaser and the price paid was $2,000,000.

Personals

ALBERT E. NEWTON, for many years with the Reed-Prentice Co., Worcester, Mass., has just been made general manager of the Collins Company, Collinsville, Conn.

FRANK W. OLIVER, well known in twist drill circles, has become associated with the Whitman & Barnes Manufacturing Co., in the capacity of Eastern sales manager with headquarters at 64 Reade St., the company's New York City store.

A. B. NEUMAN, for the past three years chief consulting engineer for the Steel and Tube Company of America, has opened offices as consulting engineer in the Peoples Gas Building, 122 S. Michigan Ave., Chicago, Ill.

A. J. MASKREY, for eleven years general superintendent of the Carnahan Sheet and Tinplate Co., of Canton, Ohio, has been made general manager of the Falcon Tinplate Co., this company having recently taken over the Carnahan plant.

CHARLES A. STREB, formerly secretary and paymaster of the Carnahan Sheet and Tinplate Co., Canton, Ohio, has been appointed general superintendent of the Falcon Tinplate Co.

HARRY BROWN, formerly connected with the Diamond Rubber Co. and the Williams Foundry Co. has been appointed factory superintendent of the Franz Foundry and Machine Co., Canton, Ohio.

R. P. VOLKNER, formerly purchasing agent for the Tate Jones Co., has been appointed to the position of sales representative of the Colonial Steel Co., Pittsburgh, Pa., with headquarters at Cleveland, Ohio.

J. W. HEMMERLE, formerly manager of the machine tool department of the Fairbanks Co., has become associated with L. A. Greene, 1113 First National Bank Building, Pittsburgh, Pa., supervising the machinery and equipment division of the business.

WILLIAM KNOX, for many years associated with the American Sheet and Tinplate Co. at their plant at Wellsville, Ohio, has been appointed to the position of assistant manager to succeed John Dunlop, resigned.

J. S. BLACK, for the past two years assistant machinist sales manager of the New Britain Machine Co., New Britain, Conn., has been appointed to the position of works manager of the Corbin Screw Division of the American Hardware Corporation, New Britain, Conn.

ROSWELL SORROW, for the past two and half years works manager of the Corbin Screw division of the American Hardware Corporation, New Britain, Conn., has tendered his resignation to take effect July 1.

HAZEN B. HINMAN, until recently in the sales department of the Stanley Works, has become associated with the Trumbull Steel Co., Warren, Ohio, in the capacity of superintendent.

GEORGE S. BARTON, president and treasurer of the Rice, Barton and Fales Machine and Iron Co., Worcester, Mass., has returned to Worcester from his recent European trip.

HENRY D. ROLPH, of the export department of the Yale and Towne Manufacturing Co., Stamford, Conn., will leave shortly for the Orient on a business trip that will take about two years. Mr. Rolph, will visit China, India, Manchuria, Australia, New Zealand, Malay States, Java, Sumatra, Siam, Philippine Islands, South Sea Islands etc.

WILLARD L. CASE, treasurer of the Yale and Towne Manufacturing Co., Stamford, Conn., has resigned his position with the company, to become a partner in the firm of Searle, Nicholson, Oakey and Lill, Accountants and Engineers, New York City.

JOSEPH N. LAPOINTE, president of the J. N. LaPointe Co., New London, Conn., has been appointed temporary receiver of the Arnold Electric Tool Co., New London, Conn., by Judge James H. Webb of the Superior Court. Mr. LaPointe is an officer and one of the principal stockholders of the Arnold firm.

J. H. TOWNE, secretary of the Yale and Towne Manufacturing Co., Stamford, Conn., has been elected treasurer of the company, to succeed Willard L. Case, recently resigned. Mr. Towne, will fill the offices of secretary and treasurer.

CHARLES A. DANA, directing head of the Spicer Manufacturing Co., South Plainfield, N. J., manufacturer of universal joints and propeller shafts, has been elected president of the Hartford Auto Parts Corp., Hartford, Conn., recently incorporated to manufacture automatic parts.

ADDISON BOREN, for the past few years connected with Yale and Towne Manufacturing Co., Stamford, Conn., has recently been elected comptroller of that company.

JOHN F. TINSLEY, vice-president and general manager of the Crompton and Knowles Loom Works, Worcester, Mass., has been appointed a member of the committee to promote a New England Industrial Exposition in Worcester in 1925, by the Worcester Chamber of Commerce.

Trade Catalogs

Steel Casements and Windows. David Lupton's Sons Co., Philadelphia, Pa., General Catalog No. 11, 191 pages, describing Lupton service and product, extensively illustrated and containing considerable data of value to architects and engineers in the application of Lupton's steel sash, casements and windows to industrial, office, apartment and residential building construction of all classes. The special catalog of 41 pages on casements and double hung windows, also available, is designed especially for architects and operative builders to show the application of steel windows to every room in the home. Both publications are of artistic merit, representing an innovation in catalogs of this kind, and are comprehensive handbooks on the steel sash industry in its broadest phases.

Grinding Practice. Norton Co., Worcester, Mass. An eight page bulletin with an artistic arrangement reviewing the progress of grinding practice with cuts illustrative of numerous modern grinding methods applied in the plant of the International Motor Car Co.

Squaring Shear Knives. Niagara Machine and Tool Works, Buffalo, N. Y. A bulletin which is, in reality, a valuable instruction sheet for users of the Niagara squaring shear. Instructions for testing the shears, as well as detailed information relative to procedure to be followed in attaching, adjusting and re-grinding the knives is given.

Drawing Instruments. The C. F. Pease Co., 813 North Franklin St., Chicago, Ill. Catalog C-22 illustrating various types of special American made drawing instruments as well as complete sets of draftsmen's tools.

Air Drills. Chicago Pneumatic Tool Co., Chicago, Ill. Bulletin 598 descriptive of various types and sizes of Little Giant air drills with tabulated data containing specifications obtaining on each size. The bulletin also contains illustrative and descriptive matter covering the Little Giant pneumatic grinders and close quarters drills.

Pyrometers. Thwing Instrument Co., 3339 Lancaster Ave., Philadelphia, Pa. Bulletin No. 11, containing 15 pages descriptive of Thwing radiation pyrometers, their construction, theory of operation and application in various industries.

Malleable Nickel. American Nickel Corp., Clearfield, Pa. Bulletin No. 101 containing useful information and tables on the chemical and physical properties of nickel.

Taps and Dies. Vermont Tap and Die Corp., Newport, Vermont. A twelve-page catalog giving information and tables of sizes of taps and drills made by this company.

Gear Cutting Machinery. Newark Gear Cutting Machine Co., 69 Prospect St., Newark, N. J. Catalog No. 4 describing the Newark No. 2-B Spur and bevel gear cutting machine for light and medium work. Complete specifications of the machine, illustrations showing samples of work done and various tables are given.

Forging and Heating Furnaces. W. S. Rockwell Co., 50 Church St., New York City. Bulletin No. 241 descriptive of heating furnaces for forging, tire, plate and angle heating with introductory matter on the subject of methods of heating and its cost.

Hardinge Conical Mill. The Hardinge Company, 120 Broadway, New York. A four-page bulletin describing the new conical mill which is made to grind both wet and dry ores for metallurgical processes and materials for industrial uses. The machine is described and illustrated in detail, and specifications and tables of operations are given.

Overhead Conveying System. Dreis and Krump Manufacturing Co., 2909 South Halstead St., Chicago, Ill. A four-page circular describing the Atlas carryall overhead conveying system.

Pamphlets Received

Getting Railroad Facts Straight. A fifty-one page pamphlet on wages, maintenance and valuation by Dr. C. S. Duncan; published by the Association of Railway Executives, 61 Broadway, New York City.

Powdered Coal Installation. A fifteen-page pamphlet by H. D. Savage, member of A. S. M. E., presented before Engineers' Society of Western Pennsylvania, Pittsburgh, Pa., describing powdered coal application. The pamphlet is published and distributed by Combustion Engineering Corporation, New York City.

Weighing by Substitution. Bulletin No. 208 of the Bureau of Standards, Washington, D. C., prepared by C. A. Briggs and E. D. Gordon, Associate Physicists of the Bureau. For sale by the Superintendent of Documents, Washington, price five cents.

Forthcoming Meetings

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

American Society for Steel Treating. Exposition and convention at the General Motors Co. building, Detroit, Oct. 2 to 7. W. H. Eisenman, 4,600 Prospect Ave., Cleveland, is secretary.

American Manufacturers Export Association annual convention, New York City, Oct. 25 and 26. Secretary, M. B. Dean, 160 Broadway, New York City.

National Founders Association, Nov. 22 and 23. Secretary, J. M. Taylor, 29 South La Salle St., Chicago, Ill.

The Weekly Price Guide

RISE AND FALL OF MARKET

Advances.—No. 2 foundry pig iron up 50c. per gross ton in Philadelphia and Chicago; heavier advances in Cincinnati. Scarcity of Connellsville coke; prices higher. Mill price of steel shapes, plates and bars, $1.70, f.o.b. Pittsburgh; quotations as high as $1.75 per 100 lb. for deliveries within 30 days. Very few orders for structural steel now being accepted at $1.60. Lower discounts quoted on bolts, rivets, nuts and washers in New York and Cleveland warehouses. Linseed oil up 2c. in New York and 7c. per gal. (5 bbl. lots) in Cleveland.

Declines.—Tin quoted in New York at 31¾c. as against 32¼c. and zinc at 6⅛c. as compared with 6¼c. per lb., last week. Zinc sheets and solder cheaper in New York; babbitt metal down in Cleveland and New York. Old brass, heavy, down ½c. per lb. and sal soda 10c per 100 lb. in Cleveland.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$23.50
Northern Basic	26.50
Southern Ohio No. 2	29.16
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	29.16
BIRMINGHAM	
No. 2 Foundry	18.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	27.32
Virginia No. 2	28.74
Basic	25.50
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	23.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	25.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.00
Basic	25.00
Bessemer	25.00

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Detroit	7.0	4.5	3.0
New York	9@10	6.0	3.0
Cleveland	6.75	4.5	2.6
Chicago	5.0	4.5	3.5
Cincinnati	6.0	5.0	4.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2 40	3.63	3.15	3.63
No. 12	2.45	3.68	3.20	3.68
No. 14	2.50	3.73	3.25	3.73
No. 16	2.70	3.83	3.35	3.83
Black				
Nos. 17 and 21.	3.00	4.15	3.55	4.30
Nos. 22 and 24.	3.05	4.20	3.60	4.30
Nos. 25 and 26.	3.10	4.25	3.65	4.35
No. 28	3.15	4.35	3.90	4.45
Galvanized steel sheets:				
Nos. 10 and 11.	3.15	4.35	3.75	4.45
Nos. 12 and 14.	3.25	4.45	3.85	4.55
Nos. 17 and 21.	3.55	4.75	4.15	4.85
Nos. 22 and 24.	3.70	4.90	4.45	5.00
No. 26	3.85	5.05	4.60	5.15
No. 28	4.15	5.35	4.90	5.45

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6@8	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.85
Hoop steel	3.63	2.81	3.48
Cold rolled strip steel	6.25	8.25	6.15
Floor plates	4.80	4.66	5.08
Cold finished shafting or screw	3.35	3.00	3.40
Cold finished flats, squares	3.85	3.50	3.90
Structural shapes (base)	2.68	2.51	2.68
Soft steel bars (base)	2.58	2.41	2.58
Soft steel bar shapes (base)	2.58	2.41	2.58
Soft steel bands (base)	3.23	3.06	3.23
Tank plates (base)	2.68	2.51	2.38
Bar iron (2.10@2.20 at mill)	2.58	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/16	8.00		12@13
⅛	6.50		11@12
5/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.62½
Tin, 5-ton lots, New York	31.75
Lead (up to carlots), St. Louis, 5.60; New York	6.25
Zinc (up to carlots), St. Louis, 5.30; New York	6.12½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	6@6.12½	7.50	6.25
Copper sheets, base	20.50	21.00	23.00
Copper wire (carlots)	16.00	17.00	16.25
Copper rods (ton lots)	19.00	22.00	19.50
Copper tubing (100-lb. lots)	22.75	24.00	23.00
Brass sheets (100-lb. lots)	16.75	18.00	18.75
Brass tubing (100-lb. lots)	20.00	21.00	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Brass wire (carlots)	17.25	17.75	.....
Zinc sheets (casks)	8.00	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....
Solder (½ and ½), (caselots)	21.00	22.00	20.00
Babbitt metal (fair grade)	24.00	41.50	36.00
Babbitt metal (commercial)	11.00	16.00	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	11.75	11.50
Copper, heavy, and wire	12.00	11.25	10.50
Copper, light, and bottoms	10.00	9.50	9.75
Lead, heavy	4.75	4.75	4.75
Lead, tea	4.25	3.50	3.75
Brass, heavy	7.00	6.00	9.00
Brass, light	6.00	5.00	6.00
No. 1 yellow brass turnings	6.50	6.00	6.50
Zinc	3.00	3.00	3.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	11.00	14.50
IC, 112 sheets	12.80	11.40	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.11¼
Cotton waste, mixed, per lb.	.055@.09	.09	.08
Wiping cloths, 13¼x13¼	....	per M. 50.00	per lb. .10
Wiping cloths, 13¼x20½	....	per M. 55.00	per lb. .13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.88	1.07	.96
White lead, dry or in oil	100 lb. kegs.	New York, 12.50	
Red lead, dry	100 lb. kegs.	New York, 12.50	
Red lead, in oil	100 lb. kegs.	New York, 14.00	
Fire clay, per 100 lb. bag		.80	1.00

Coke, prompt furnace, Connellsville......per net ton $7.50@$8

Coke, prompt foundry, Connellsville..........per net ton $8.50

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	50%	65–10%	60%
1⅛ and 1¼x3 in. up to 12 in.	33⅓%	60%	60-10%
With cold punched sq. nuts	35%	....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	40%	....	$4.00 off
Button head bolts, with hex. nuts	25%	$3.90 net	.....
Hex. head and hex. nut bolts	30%	....	65-5%
Lag screws, coach screws	50%	....	60-5%
Square and hex. head cap screws	70–10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	40%	60%	50–5%
Bolt ends, with hot pressed nuts	50%	....	55%
Tap bolts, (h.h. plus std. extra of 10%)	10%	....	.....
Semi-finished nuts ⅝ and larger	65%	70–10%	80%
Case-hardened nuts	60%	....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	3.50	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	2.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	2.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	2.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	2.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	70%	60-10%
Rivets, tinned	60-5%	70%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$4.00	$3.25	$3.10
Cone heads, ditto (net)	4.10	3.35	3.20
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	....	0.15
⅝ in. diameter *EXTRA*	0.15	....	0.15
½ in. diameter *EXTRA*	0.50	....	0.50
1 in. long, and shorter *EXTRA*	0.50	....	0.50
Longer than 5 in. *EXTRA*	0.25	....	0.25
Less than 200 lb. *EXTRA*	0.50	....	0.50
Countersunk heads *EXTRA*	0.35	......	$3.35 base
Copper rivets	55–5%	50%	50-%
Copper burs	35%	50%	20%

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.28@0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin.ft., $2.88:			
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40-10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.40
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Ala., Birmingham—The County Coal Co., 6833 1st Ave., H. Neny, Purch. Agt.—small lathe, drill press for 2 in. drill, and general equipment for machine shop. Also bids on all-steel tipples.

Col., Denver—The Chicago, Burlington & Quincy Ry., 547 West Jackson Blvd., Chicago—

One slotter with 20 in. and one with 16 in stroke.

One 48 in., one 42 in., one 32 in., one 30 in., one 36 in., seven 24 in., one 28 in., seven 18 in. and three 16 in. engine lathes.

One 7½ in. heavy duty type turret lathe, one 4½ in. hollow hexagon turret lathe, one 3½ in. hollow hexagon turret lathe, with automatic fed and power traverse to turret, one flat turret lathe to handle chuck work up to 16 in. diameter, one 3½ in. hollow hexagon turret lathe arranged for motor drive, 440 V. A. C., with automatic chucks, sets of bushing, universal turners, automatic opening die head, two tool holders and one pointing tool, one 2½ in. Universal hollow hexagon turret lathe.

Two full Universal monitor lathes.

One squaring shear foot power.

Two hand bending rolls.

One bolt centering machine.

One hydraulic driving wheel press, 600 ton capacity, one hydraulic vertical type press, 100 ton, one hydraulic horizontal type press, 100 ton.

Two vertical power presses.

One 5,000 lb., one 2,000 lb., one 1,800 lb. double frame steam hammers.

One 500 lb. and one 200 lb. upright Helve hammers.

One pneumatic flanging clamp, one pneumatic flanging machine.

One open end type bar iron shear capacity to shear bars to 1½ in. diameter, one open end type bar iron shear capacity to shear bars up to 2½ in., two double end punch and shear.

One single end horizontal type punch.

One sheet metal cutter.

Twelve pedestal dry grinders, one pedestal twist drill grinder, two pedestal wet grinders, one plain grinder, one Universal grinder, one vertical single spindle grinder, one oscillating surface grinder, four 48 in. grind stone mounted in metal casing for wet grinding.

Four heavy duty type upright drills, two 72 in. and one 48 in. radial drills, one 36 in., one 24 in. and three 20 in. upright drills.

One crank and four heavy duty type crank shapers.

One double spindle drill press.

One 96 in., one 54 in., one 42 in., one 36 in. and one 30 in. vertical boring mills.

One 36 in. x 36 in. x 10 ft., one 72 in. x 72 in. x 30 ft. and one 48 in. x 48 in. x 10 ft. bed planers.

Two heavy duty type milling machines.

One 2 in. forging machine.

One single head and one triple head bolt cutters.

One double head staybolt and crownstay machine.

Two pipe threading and one pipe bending machines.

One 3½ in. horizontal boring machine.

Above tools for use in shops here.

Ill., Chicago—Toth & Co., 1301 Larabee St.—machine tools and dies for machine shop.

Ill., Joliet—Bd. of Educ.—twelve 14 in. x 6 ft. standard lathes; twelve 14 in. x 6 ft. Mendley or American engine lathes with quick change gears and taper attachment; one American or Hendley tool room lathe; one No. 2 turret lathe; one 4 in. centering machine; one 8 in. x 36 in. Universal grinding machine; one small surface grinder; one 2½ in. drill grinder; six No. 2 Universal milling machines; two duplex No. 2 milling machines; one 30 in. vertical boring mill; one 30 in. x 30 in. x 6 ft. planer with one head on cross rail; eight 16 in. shapers; one small hardening furnace; seventeen bench vises with swivel cases.

Ind., East Chicago—Green Eng. Co.—two heavy duty drilling machines and one double disc grinder.

Kan., Cheney—E. J. Robinson—equipment for machine shop including lathes, forge presses, drills, grinder, etc.

Kan., Wichita—Motor Q Battery Co., 1619 East Douglas Ave., J. W. Martin, Purch. Agt.—drill press, lathe, emery wheel, belting, motor for power equipment.

Kan., Wichita—Richmond Electric Co., 237 South Topeka Ave., G. E. Richmond, Purch. Agt.—one power lathe.

Kan., Wichita—J. Spear Motor Specialty Shop, South Topeka Ave.—power lathe for machine shop.

Kan., Wichita—W. Sterling, 113 West 3rd St.—power lathe, drill press, emery wheel, and combination saw with motor and belting.

Kan., Wichita—Wichita Key & Novelty Co., 132 North Topeka Ave., J. Walker, Purch. Agt.—keyseating power machinery, lathe and hand drill press.

Kan., Wichita—Woods & Bailey, 153 North Emporia Ave.—portable electric drill, taps and die machine for garage.

Mich., Wyandotte—The All Metal Products Co., Labadie St.—miscellaneous metal working equipment for machine shop.

Mo., Kansas City—P. W. Deem, Fairmont Park—power wood lathe and band saw.

Mo., St. Louis—J. O. Coleman, 106 North 3rd St.—electric power drill for machine shop.

N. Y., Buffalo—J. Blatz, 343 East Ferry St.—equipment and machinery for proposed garage and service station.

N. Y., Buffalo—The Bd. Educ., 1401 Telephone Bldg., will receive bids until July 5, machine tools and equipment for woodworking shop, line shafting and pulleys, tempering furnace and blower, printing press.

N. Y., Brooklyn—Empire Metal Specialty Co., 327 16th St.—machine for light metal die works.

N. Y., Buffalo—M. Gevertzman, 1330 Genesee St. — equipment for proposed garage.

N. Y., Buffalo—J. Naples, 219 South Division St.—equipment for garage and service station.

N. Y., Buffalo—Swan Garage, Inc., East Swan St.—additional machinery, tools and equipment for proposed garage.

N. Y., Buffalo—M. Swerldorf, 2297 Main St.—equipment for proposed garage

N. Y., Buffalo—C. H. Tracey, 127 Allen St.—additional equipment for automobile service station on West Utica St.

N. Y., Copenhagen—Deer River Power Co., Inc.—equipment for machine shop.

N. Y., Mt. Vernon—J. Moller, 7 Valentine St.—flexible shaft for grinding dies.

N. Y., New York—Rathbun & Bird, 17 Walker St.—one vertical milling machine with rotary table.

O., Canton—The Arctic Ice Machine Co., Market St., S. and Penna. Ry.—machinery and equipment for proposed machine shop in connection with factory.

O., Cleveland—The Ohio Body & Blower Co., Detroit Ave. and 91st St.—one double crank press.

Pa., Bridgeville—Universal Steel Co.—roll turning lathe for 8 and 10 in. mill rolls.

Pa., Greenville—Greenville Steel Car Co., foot of Union St.—machinery and equipment for proposed factory and foundry, for the manufacture and repair of steel cars.

Pa., McKeesport—The Bd. Educ.—four band saws, ten 12 in. lathes, 1 planer, 1 shaper, 1 milling machine.

Pa., Mercer—Elliott Blair Co., East Market St.—equipment for proposed addition to steel plant.

Pa., Phila.—The Jones Machine Wks. Co., Landowne Ave. and 53rd St.—machinery and equipment for new machine shop.

Pa., Pittsburgh—The Stonecrete Corp., 6023 Penn Ave.—one small and one large drill press, 2 engine lathes, 1 shaper, 1 band saw, 1 punch and shear, 1 boring mill, belting, shafting, motors, and other equipment (used).

Pa., Pottsville—T. Golden, 315 North Center St.—small tools and equipment for large automobile service station and repair shop, soon to be constructed.

Tex., Beaumont—Gulf Welding & Machine Wks., 357-359 Pine St.—foundry and machine shop equipment.

Va., Big Stone Gap—H. C. Stuart—machinery and equipment for proposed garage.

Va., South Boston—South Boston Mfg. Co., J. O. Watkins, Secy.—machine shop and foundry equipment.

W. Va., Huntington—W. O. Hundley—machinery and equipment for auto repair and machine shop.

Wis., Boscobel—C. P. and H. F. Miller Co.—equipment for proposed auto repair shop.

Ont., Georgetown—J. O'Neill & Son, (garage and auto repair shop)—tools and equipment.

Wis., Kenosha—G. L. Ross, Public Service Bldg.—gasoline storage tank and pump and small tools for proposed garage.

Wis., Milwaukee—M. Froehlig, c/o P. E. Schaefer, Archt., 401 4th St.—gasoline storage tank with pump for proposed garage.

Wis., Milwaukee—Rautbord Mfg. Co., 86-88 Detroit St.—shaper and punch press.

Ont., London—London Metal Products, Ltd., D. Soper, Mgr.—wood and metal working machinery and tools for new plant.

Ont., Palmerston—I X L Mfg. Co., J. Youngson, Mgr.—tools and special machinery for the manufacture of batteries and materials.

Machinery Wanted

Ark., Fayetteville—Parker Bros.—2 revolution front delivery pony cylinder press, Miehle preferred.

Ark., Little Rock—Arkansas Fdry. Co., 6th St.—foundry equipment to replace that which was recently destroyed by fire.

Cal., Los Angeles—Imperial Cotton Mills Co., Loews State Theatre Bldg.—$750,000 worth of spindles and machinery for proposed cotton mill.

Fla., Frostproof—Chase & Co.—machinery and equipment for proposed fruit packing and canning plant.

Fla., Jacksonville—Milldale Ice Co., 1010 East Bay—machinery and equipment for proposed ice manufacturing plant.

Ga., Forsyth—Forsyth Hosiery Mills—Scott & Williams needle machines (220) Model B-5 (used).

Ga., Macon—Amer. Bakeries Co., 501 Cotton Ave.—equipment for new bakery.

Ga., Macon—Case-Fowler Lumber Co.—machinery for proposed lumber mill.

Ia., Chariton—The School Board, P. T. Perry, Secy.—manual training equipment for proposed high school.

Ill., Chicago—Chicago, Burlington & Quincy R R., Jackson Blvd. and Clinton Sts—two gantry cranes, 105 ft. between legs and 155 ft. over all; three 15 ton, two 225 ton, two 50 ton and two 10 ton cranes.

Ill., Chicago—M. M. Rothschild Co., Inc. 717 Federal St., (job printers)—power automatic press.

Ill., Chicago—Western Newspaper Union, 210 South Desplaines St.—Optimus printing press.

Ill., Rock Island—Servus Rubber Co., J. T. Crowley, Purch. Agt.—vulcanizers.

Ia., Thurman—F. Flatt—linotype machine.

Ia., Waterloo—Rath Packing Co., Inc.—machinery and equipment for packing and power house.

Kan., Wichita—Advance Publishing Co., 137 South Topeka St., L. C. Ball, Purch. Agt.—automatic power paper cutter.

Kan., Wichita—C. W. Gothern, 304 North Main St.—power grinding machinery.

Kan., Wichita—Steffins Ice Cream Co., 623 East 1st St., J. B. Pottinger, Purch. Agt.—shafting, belting, hangers, bearings and pulleys for new factory.

Ky., Princeton—J. L. Poole—flour mill machinery and equipment for plant, 100 bbl. per day capacity, (new or used).

Md., Hagerstown—Hagerstown Re-Tinning & Plating Wks., M. L. Bingley, Pres.—machinery and equipment for plating and re-tinning works.

Mich., Detroit—Bernard Stamping Co., 7175 Clayton St.—miscellaneous equipment for manufacturing metal stampings.

Mich., Detroit—Burr-Patterson Co., 4211 Woodward Ave.—miscellaneous equipment for the manufacture of jewelry.

Minn., St. Paul—L. F. Dow Co., 381 Jackson St.—machinery equipment for proposed half million dollar plant; equipment for print shop, lithographing, leather goods, manufacture, etc.

Minn., St. Paul—The State Board of Control, D. F. Mullen, Secy.—electric crane and air compressors to equip new mines experiment station at State University physical plant.

Minn., Scanlon—Minnesota Slate Co., G. W. Edwards, Pres.—machinery for mining, manufacturing and preparing slate for roofing.

Minn., South St. Paul—Katz & Horne Packing Co., L. D. Horne, 229 East 4th St., St. Paul, Purch. Agt.—machinery and equipment for proposed packing plant.

Miss., Hazelhurst—W. H. Emerson—refrigeration machinery and equipment for 25 ton ice plant.

Miss., Jackson—Clarion-Ledger—proof press for 8 column, 21 in. page galley.

Mo., Kansas City—Riggen-McLaughlin, 18th and Montgall Sts., job printers—12 x 18 Miller power press.

Mo., St. Louis—Modern Printing Co., 2604 Olive St.—12 x 18 Chandler & Price printing press.

N. J., Anglesea—The Arctic Ice Co., W. E. Epler, Genl. Mgr.—two 50 ton ice machines for refrigeration and cold-storage plant.

N. Y., Buffalo—Allen Mfg. & Welding Corp., 163 Adam St.—welding machines and equipment for factory on Washington and Tupper Sts.

N. Y., Buffalo—Behringer Bros. Planing Mill, 171 Imson St.—quantity of 8 and 12 in. leather belting.

N. Y., Buffalo—M. Brownstein, 396 Bway.—machinery and equipment for the manufacture of candy.

N. Y., Buffalo—Eastern Oil Refining Co., J. S. Embleton, Vice-Pres.—one 12,000 gal. gasoline storage tank, also one 550 gal. tank and pump for filling station.

N. Y., Buffalo—The Eberhardt Steel Products Co., 43 Chelsea St.—machinery and equipment for small blacksmith shop.

N. Y., Buffalo—C. LaDuca, 224 Front Ave.—equipment for large bakery.

N. Y., Buffalo—H. Wile & Co., Ellicott and Carroll Sts.—one portable electric sander for refinishing table tops.

N. Y., Brooklyn—J. P. Stenger & Son, 226 Van Sicklen Ave. (glass labels)—small oval glass cutting machine.

N. Y., Gorham—Babcock Pickling & Canning Plant—machinery and equipment for cabbage and canning plant now under construction.

N. Y., Jamestown—Ulrich Plan File Co., 516 West 4th St., manufacturer of vertical filing equipment for offices, etc.—machinery and equipment for proposed factory including buzz saws, etc.

N. Y., New York—Star Photo Mountings Co., 242 Lafayette St.—one No. 4, 14 x 18 in. embossing machine for paper.

N. Y., New York—Sterling Shop, 206 West 29th St.—one jig saw, suspension type.

N. Y., Rochester—Du Bois Press, 82 St. Paul St.—machinery and equipment for remodeled printing plant.

N. Y., Rochester—The Morrey Co., 42 Cortland St.—equipment for proposed addition to sheet metal plant.

N. Y., Rochester—The North East Electric Co., 348 Whitney St., address Purch. Dept.—sand blast barrel, New Haven No. 2 preferred (used).

N. C., Rutherfordton—Peoples Ice and Fuel Co.—machinery and equipment for propoesd ice manufacturing plant.

N. C., Sanford—Sanford Sash & Blind Co., plans to establish match plant—machinery for the manufacture of matches.

O., Akron—Akron Engraving Co., 330 South High St.—proof press.

O., Columbus—E. A. Prentice Lumber Co., Vine and Armstrong Sts.—one window frame machine, one small planer, and other woodworking machinery.

O., Ironton—Ironton Boiler Wks. Co.—one 20 hp. double drum hoisting engine, without boiler, one 5 ton and one 10 ton stiff leg derrick (new or used).

O., Kenmore—The Palmer Match Co., Inc.—machinery and equipment for proposed match manufacturing plant.

O., Newton Falls—Newton Steel Co.—three cranes, including one 10 ton and one 30 ton.

Pa., Bradford—Hall & Thomas, 45 Hilton St., B. F. Hall, 210 South Ave., Purch. Agt.—machinery and equipment for the manufacture of waterproof cement caskets.

Pa., Bridgeport—Gehret Bros.—machinery and equipment for proposed iron works.

Pa., Erie—Erie Burial Casket Co.—machinery for new casket manufacturing factory.

Pa., Frankford (Phila. P. O.)—Amer. Pile Fabric Co.—one padding mangle machine for goods about 56 in. wide (used).

Pa., Hershey—Wirth Chocolate Co., Inc.—machinery and equipment for chocolate factory, to be established at Cleon.

Pa., Oil City—National Pump & Machine Co.—machinery and equipment for new foundry.

Pa., Phila.—Philadelphia Paper Co., Nixon and Fountain Sts.—overhead cranes and conveyor equipment for proposed paper storage plant.

Pa., Pittsburgh—Star Ornamental Iron & Wire Co., c/o H. Blum, 2525 Frazier St.—equipment for iron works.

Pa., Sharpesville—Sharpesville Furnace Co.—skip hoist machinery.

Pa., Sheffield—T. N. B. Stover—machinery and complete equipment for drilling operations (oil and gas) near here.

Pa., Wampum—J. Wirtz—equipment and machinery for proposed concrete block factory, on farm.

Pa., Williamsport—J. Peters Packing Co., 1320 East 3rd St.—machinery for proposed cold storage and refrigeration plant.

R. I., Westerly—W. MacKenzie, Box 432, manufacturer of textile machinery—spinning frames, (used).

S. C., Laurens—W. G. Lancaster—machinery and equipment for small ice manufacturing plant, (new or used).

S. C., Sumter—Gable-Christal Co., Inc.—special machinery for the manufacture of insect traps, etc.

Tex., Breckenridge—The Ebony Carbon Co.—machinery and equipment for new carbon black factory.

Va., Harrisonburg—The Newtown Giant Incubator Corp., J. P. Burke, Mgr.—woodworking machinery, incl., tenoner, surfacer, jointer, mortiser, chipbreaker, etc.

W. Va., Hookersville (Muddlety P. O.)—Muddlety Valley Clay Products Co., F. Herold, Almorris, Mgr.—machinery and equipment for the manufacture of brick and other clay products.

Wis., Allenville—H. H. Kalbus, Route 18—cheese making machinery and vats.

Wis., Beloit—T. B. Goodall, Broad St.—pump, storage tanks, etc., for proposed filling station at Clinton.

Wis., Iola—Gronwald & Co., S. A. Gronwald, Pres.—machinery for cutting and polishing monuments and stone.

Wis., Manitowoc—A. M. Ritcher Sons Co., South 8th and Madison Sts.—machinery for proposed vinegar factory.

Wis., Merrill—Wisconsin Valley Co., Inc., c/o W. H. Au Buchon, Secy., 400 Mills St.—special machinery for proposed excelsior factory.

Wis., Milwaukee—Opitz Mfg. Co., 67 Erie St.—Peerless or Racine hack saw.

Wis., Milwaukee—F. L. Reitz, 266 14th St.—paper baling machine.

Wis., Milwaukee—Sewerage Com., 508 Market St., J. F. Fowles, Secy.—will receive bids until July 7, for one 20 ton electric traveling crane.

Wis., Waunakee—A. Simpson—stamping machines.

Wis., Racine—J. Horlick, Route 2, Box 10, Horlicksville (Racine P. O.)—seed grinding machinery for proposed grist mill.

Wis., West Allis—J. Souska, National Ave.—electric shoe repairing machinery.

Alta, Chipman—The Chipman Flour Mills Corp.—machinery and equipment for mills.

N. B., Hillsborough—A. Peck—machinery and equipment for proposed woodworking factory.

Ont., Lynden—R. A. Thompson (lumber mill)—machinery for sawmill addition.

Ont., Niagara Falls—Niagara Falls Arena Co., Ltd., c/o G. Morse, Main St., Niagara Falls South—equipment for proposed artificial ice and refrigeration plant.

Ont., Welland—The St. Thomas Packing Co., Ltd.—refrigerating equipment for proposed cold storage plant.

Ont., Welland—Tomkins Bakery, North Main St.—bakeshop equipment to replace that destroyed by fire.

Metal Working Shops

Cal., Berkeley—Bd. Educ. will soon award the contract for the construction of 1 story school shops for the Berkeley School Dist., 2133 Alliston Way. Estimated cost $16,000. W. H. Ratcliff, 1st Natl. Bank Bldg., Archt.

Cal., Porterville—Porterville Union High School Dist., E. St., has awarded the contract for the construction of a shop building for the Union High School Dist. Estimated cost $38,283. Noted Jan. 19, 1922.

Cal., San Diego—The Bureau of Yards & Docks, Navy Dept., Wash., D. C., has awarded the contract for the construction of hangars, shop, oil and paint storehouse, gasoline tanks, pumps and distributing system, etc., at the Naval Base here. Estimated cost $243,500.

Conn., Branford—Military Emergency Bd., State Armory, Hartford, has had plans prepared for the construction of a 1 story, 85 x 150 ft. shop, at rear of State Armory, here. Estimated cost $40,00· Payne & Keefe, Manwaring Bldg., New London, Archts.

Ill., Chicago—E. Edelmann & Co., c/o D. S. Klafter, Archt., 64 West Randolph St., is having plans prepared for the construction of a 2 story, 150 x 250 ft. factory for the manufacture of auto accessories. Estimated cost $250,000.

Ill., Chicago—Ideal Sheet Metal Wks., 213 North Morgan St., is having plans prepared for the construction of a 3 story, 72 x 125 ft. factory, for the manufacture of auto and aeroplane supplies, at 2039-43 West Jackson Blvd. Estimated cost $75,-000. M. O. Nathan, 70 West Monroe St., Archt.

Mass., Dorchester (Boston P. O.)—P. B. Mutrie, 11 Pearl St., plans to build a 1 story, 90 x 110 ft. garage on Pearl St. Estimated cost $40,000.

Mass., Springfield—W. Lay, Bridge St., has awarded the contract for the construction of a 1 story, 100 x 150 ft. garage and sales room. Estimated cost $50,000.

Mich., Detroit—A. Kahn, Archt., 1000 Marquette Bldg., is receiving bids for the construction of a 2 story, 40 x 106 ft. jewelry factory on Rose and 16th Sts., for Burr-Patterson Co., 4211 Woodward Ave. Estimated cost $40,000.

N. J., Hoboken—Fischer & Sweeney Bronze Co., 312 Adams St., will soon award the contract for the construction of a 1 and 2 story, 100 x 200 ft. foundry on 13th and Grand Sts. Lockwood Green, 101 Park Ave., New York, Engrs. and Archts.

N. Y. Brooklyn—Kruse Motor Co., 1111 Flatbush Ave., has awarded the contract for the construction of a 1 story, 100 x 100 ft. garage and service station on Nostrand Ave. and Ave. I. Estimated cost $50,000.

N. Y., Buffalo—Swan Garage, Inc., East Swan St., plans to build a 3 story 90 x 118 ft. garage. Cost to exceed $40,000. C. J. Irwin, Pres. Architect not announced.

N. Y., Jamestown—Ulrich Plan File Co., 516 West 4th St., plans to build a factory on Murray Ave., for the manufacture of vertical filing equipment for offices, etc. Estimated cost $18,000. Architect not announced.

O., Cleveland—F. Fanta, 5813 Clark Ave. will receive bids until July 5, for the construction of a 1 story, 44 x 116 ft. garage at 5914 Merrill Ave. Estimated cost $40,000. Private plans.

O., Cleveland—Greenwald, Stecker & Wallach, 535 Society for Savings Bldg., has awarded the contract for the construction of a 2 story, 67 x 268 ft. garage and store building at 1934 East 105th St. Estimated cost $125,000. Noted Nov. 17, 1921.

O., Cleveland—The Independent Towel & Supply Co., 1822 Central Ave., has awarded the contract for the construction of a 1 and 3 story, 80 x 100 ft. and 79 x 90 ft. laundry and garage. Estimated cost $100,000. Address S. Miller, c/o owner.

O., Cleveland—The Ohio Crank Shaft Co., 982 East 152nd St., has awarded the contract for the construction of a 1 story, 60 x 200 ft. factory at 6510 Clement Ave. Estimated cost $70,000. Noted June 8, 1922.

Pa., Greenville—Greenville Steel Car Co., foot of Union St., will build a 73 x 390 ft. factory and foundry building, 42 ft. high, for the manufacture and repair of steel cars. Estimated cost $200,000.

Pa., Mercer—Elliott Blair Co., East Market St. plans to build a large addition to its steel plant. Estimated cost $250,000. Architect not selected.

Pa., New Castle—Penn-Ohio Electric Co., plans to issue $1,950,000 bonds for extensions and improvements to its lines, shops and stock.

Pa., Pittsburgh—Mueller Bros.. 5101 Baum Blvd., plans to build an 80 x 160 ft. auto sales and service station addition on Baum Blvd. and Woodworth St.

Pa., Shamokin—I. H. Wetzel will soon receive bids for the construction of a 2 story, 80 x 100 ft. garage and service station. Estimated cost $75,000. W. H. Lee, 32 South 17th St., Phila., Archt.

Pa., Trafford City—Westinghouse Electric & Mfg. Co., East Pittsburgh, is having plans prepared for the construction of a 1 story, 50 x 135 ft. tin shop here. Estimated cost $40,000. B. H. Prack, Keystone Bldg., Pittsburgh, Archt.

S. D., Mitchell—The Rozum Motor Co., 400 East 4th Ave., has awarded the contract for the construction of a 1 story, 142 x 150 ft. garage. Estimated cost $40,000.

Va., Big Stone Gap—H. C. Stuart is having plans prepared for the construction of a garage. Estimated cost, including machinery and equipment, $20,000 to $30,000. Architect not announced.

Wis., Boscobel—C. P. and H. F. Miller Co. are having plans prepared for the construction of a 2 story 50 x 95 ft. garage. Estimated cost $40,000. Private plans.

Wis., Kenosha—G. L. Ross, Public Service Bldg., has awarded the contract for the construction of a 1 story, 66 x 126 ft. garage on Sheridan Rd. Estimated cost $40,000. Private plans.

Wis., Milwaukee—P. E. Schaefer, Archt., 401 4th St., is receiving bids for the construction of a 1 story, 50 x 125 ft. garage on Center and 29th Sts., for M. Froehlig, c/o Architect. Estimated cost $40,000.

Wis., Waukesha—G. W. Harter has awarded the contract for the construction of a 1 story, 50 x 90 ft. garage. Estimated cost $40,000. Private plans.

General Manufacturing

Ariz., Morenci—Stargo Mines, Inc., will build a cyanide mill. Estimated cost $75,000.

Cal., Colusa—California Prune and Apricot Growers' Assn. is receiving bids for the construction of a 1½ story cannery. Estimated cost $100,000. Private plans. Noted June 8, 1922.

Cal., Los Angeles—Imperial Cotton Mills Co., Loews State Theatre Bldg., has awarded the contract for converting a brewery into a cotton mill, and building a 2 story addition for weave room containing 60,000 sq.ft. floor space. Estimated cost $250,000. Moran Co., 207 Kerckoff Bldg., Engrs. and Archts.

Cal., Napa—California Prune & Fruit Growers Assn., Market and San Antonia Sts., San Jose, will soon receive bids for the construction of a 141 x 144 ft. addition to its cannery, here. Estimated cost $75,000. Private plans.

Cal., Oakland—Tribune Publishing Co., Oakland Tribune Bldg., is having sketches made for the construction of a 15 story newspaper, publishing, and office building at 13th and Franklin Sts. E. T. Foulkes, Croker Bldg., San Francisco, Archt.

Cal., Pittsburg—Pioneer Rubber Mills, 68 Sacramento St., San Francisco, having plans prepared for the construction of a factory here. Estimated cost $100,000. G. Towne, Genl. Mgr. B. G. McDougall, 381 Bush St., San Francisco, Archt.

Cal., San Francisco—L. R. Lurie, Mills Bldg., has awarded the contract for the construction of a 1 story printing plant, on Howard near 5th St. Estimated cost $25,000. Leighton Press, 516 Mission St., lessee.

Cal., Stockton—The City of Stockton had plans prepared for the construction of a shop and alterations to old shop on high school grounds. Estimated cost $25,000. L. Stone, Belding Bldg., Archt.

Conn., Essex—E. E. Dickenson & Co. will soon award the contract for the construction of a 2 story, 40 x 100 ft. addition to its witch hazel plant. Estimated cost $40,000. Bilderbeck & Langdon, Inc., 159 State St., New London, Engrs. and Archts.

Conn., Hartford—Buck & Sheldon, Inc., Engrs. and Archts., 60 Prospect St., are receiving bids for the construction of a 1 story, 100 x 110 ft. printing plant on Franklin Ave., for R. S. Peck & Co., 26 High St.

Fla., Frostproof—Chase & Co. will soon receive bids for the construction of a 2 story, 75 x 150 ft. fruit packing and canning plant. Estimated cost $30,000. G. R. Williams, Mgr. and Engr. Private plans.

Fla., Leesburg—Municipal Ice Plant plans to alter and improve its plant. Estimated cost including new machinery $50,000. Address W. E. Rogers, Leesburg, Engr.

Idaho, Nampa—Idaho Sash, Door & Glass Co. plans to build a sash and door factory. Estimated cost $60,000. M. Frenzill, Pres. Private plans.

Ill., Chicago—M. M. Fishman, Archt., 118 North La Salle St., is receiving bids for the construction of a 3 story 133 x 166 ft. factory for the manufacture of brassieres and corset accessories, on Irving Park Blvd. and Hermitage Ave., for Natures Rival Co., 306 South Franklin St. Estimated cost $180,000.

Ill., Chicago—Shea-Smith & Co., 322 Federal St., has awarded the contract for the construction of a 4 story, 86 x 150 ft. printing plant on Ashland Ave. Estimated cost $250,000.

Minn., St. Paul—L. F. Dow Co., 381 Jackson St., plans to build a printing plant and office building on University and Hampdon Aves. Estimated cost $400,000.

N. H., Nashua—Nashua Mfg. Co. has awarded the contract for the construction of a 1 story, 50 x 140 ft. addition to its cotton goods plant. Estimated cost $30,000.

N. H., Plaistow—Merrimack Clay products Co., 38 Newbury St., Newton Center, Mass., plans to build a 1 story plant here, for the manufacture of hollow tiles. Estimated cost $125,000. M. A. McGrath, Treas. Private plans.

N. J., Trenton—Freeman Electric Co., 803 East State St., plans to renovate its porcelain plant and build a 1 story addition. Estimated cost $50,000. R. G. Consolloy, Commonwealth Bldg., Archt.

N. Y., Long Island City—Ridley's, 345 West 40th St., New York, has awarded the contract for the construction of a 4 story factory for the manufacture of candy, on Queen Blvd. and Moore St., here. Estimated cost $150,000.

N. Y., Long Island City—Wheeling Corrugating Co., 16 Desbrosses St., New York, has awarded the contract for the construction of a 6 story plant on Nelson Ave. from School St. to Vandam St., here, for the manufacture of paper. Estimated cost $250,000.

N. Y., Lowville—Silicia Products Co., Inc., plans to build a factory for the manufacture of silicia products, on North State St. Estimated cost $100,000.

N. Y., Phelps—A. S. Rathbun plans to build a 3 story, 45 x 65 ft. flour mill on Canandaigua Outlet, to replace one destroyed by fire. Estimated cost $25,000. Architect not announced.

N. Y., Rochester—Amer. Woodworking Mchy. Co., Lyell Ave., plans to build a 110 x 130 ft. addition to its factory. Estimated cost $18,000. Architect not announced.

N. C., Winston-Salem—Bailey Bros. will receive bids until July 15 for the construction of a 5 story, 60 x 150 ft. factory for the manufacture of cigarettes. Estimated cost $100,000.

O., Cleveland—Cleveland Kraut & Pickle Co., 1191 East 22nd St., plans to build a 2 story, 80 x 130 ft. factory at 3333 Lakeside St. Estimated cost $50,000. D. S. Duncan, Mgr. Architect not selected.

O., Cleveland—Penton Publishing Co., c/o R. E. Powers, Treas., 1136 Chestnut Ave., has awarded the contract for the construction of a 9 story, 135 x 135 ft. publishing plant on West 3rd St. and Lakeside Ave. Estimated cost $500,000. Noted April 13, 1922.

Pa., Franklin—Lakeside Refining Co., plans to make improvements to plant taken over from the Foco Oil Co. Estimated cost $60,000.

Pa., Kane—Amer. Plate Glass Co. has awarded the contract for the construction of a 1 story, 80 x 100 ft. addition to its factory.

Pa., Lancaster—Bayuk Bros., 3rd and Spruce Sts., plan to build a 3 story 80 x 176 ft. factory for the manufacture of cigars. Estimated cost $105,000. E. A. Wilson, 1208 Chestnut St., Archt.

Pa., New Kensington—Premier Baking Co., c/o Fayette Baking Co., Connellsville, is having plans prepared for the construction of a 3 story, 80 x 99 ft. bakery here, on Stanton Ave. Estimated cost $100,000. B. H. Prack, Keystone Bldg., Pittsburgh, Archt.

Pa., Phila.—Colonial Biscuit Co., 12th and Brown Sts., is receiving bids for the construction of a 2 story, 65 x 65 ft. cracker factory. Estimated cost $30,000. Private plans.

Pa., Pittsburgh—Atlantic & Pacific Tea Co., Bay St., Jersey City, N. J., has awarded the contract for the construction of a garage, warehouse and stable on Dallas Ave., here. Estimated cost $500,000.

Pa., Pittsburgh—J. L. Beatty, Archt., Jackson Bldg., is receiving bids for the construction of a 5 story, 135 x 350 ft. candy factory at 13th and Pike Sts., for Hardie Bros., 1601 Liberty Ave. Estimated cost $170,000.

Pa., Sharon—Valley Packing & Provision Co. plans to build a 40 x 70 ft. addition to its packing plant on Franklin St. Estimated cost $5,000. Architect not announced.

Pa., Washington—Observer Publishing Co. has awarded the contract for the construction of a 2 story, 60 x 150 ft. publishing plant on Main St. Estimated cost $150,000.

Pa., West Hickory—H. H. Smith & Co., Ridgeway, Pa., plans to rebuild its tannery destroyed by fire, here. Estimated cost $50,000. P. R. Smith, Mgr. Architect not announced.

R. I., Providence—Silver & Drain Co., Inc., 228 South Main St., plans to build a 1 story 50 x 100 ft. addition to its plant, for the manufacture of ventilating equipment. Estimated cost $25,000. Private plans.

Va., Abingdon—Abingdon Lumber Corp. plans to build additions to its mill. Estimated cost including machinery, $16,000 to $20,000. T. M. Clapp, Secy.

W. Va., Hookersville (Muddlety P. O.)—Muddlety Valley Clay Products Co., is receiving bids for the construction of a 20 x 120 ft. plant. Private plans. F. Herold, Almorris, Mgr.

Wis., Clinton—T. B. Goodall, Broad St., Beloit, has awarded the contract for the construction of a 1 story, 50 x 55 ft. filling station on Main St., here. Estimated cost $40,000.

Wis., Fort Atkinson—Fort Atkinson Canning Co. plans to build a 2 story, 75 x 200 ft. canning factory. Estimated cost $150,000.

Wis., Manitowoc—A. M. Ritcher Sons Co., South 8th and Madison Sts., has awarded the contract for the construction of a 1 and 2 story 110 x 122 ft. factory for the manufacture of vinegar. Estimated cost $40,000.

Wis., Merrill—Wisconsin Mfg. Co., c/o E. Chauvin, plans to build a 2 story 50 x 90 ft. factory for the manufacture of sweeping compound. Estimated cost $45,000. Architect not selected.

Alta., Sawridge—Field & Patterson plan to build a sawmill. Estimated cost $30,000. Architect not announced.

Ont., Lindsay—J. Hadley plans to build a shingle factory to replace the one destroyed by fire. Estimated cost including machinery $60,000.

Ont., Millbank—H. E. Ratz Co. plans to rebuild its sawmill which was destroyed by fire.

Ont., Niagara Falls—Niagara Falls Arena Co., Ltd., c/o G. Morse, Main St., Niagara Falls South, plans to build a 1 story ice arena (5,000 seating capacity), to be used as a skating and hockey arena, and also for the manufacture of ice for domestic use, and for cold storage purposes. Estimated cost $50,000.

Ont., Tillsonburg—W. Ruth plans to build a 2 story, 40 x 50 ft. bakery. Estimated cost $20,000.

Que., St. Johns—Franco-Canadian Dyeing Co. has awarded the contract for the construction of a 1 and 2 story, 300 x 200 ft. plant, including carpenter shop and garage. Estimated cost $180,000.

American Machinist

McGraw-Hill Company, Inc. New York 25 cents a copy

April 13, 1922

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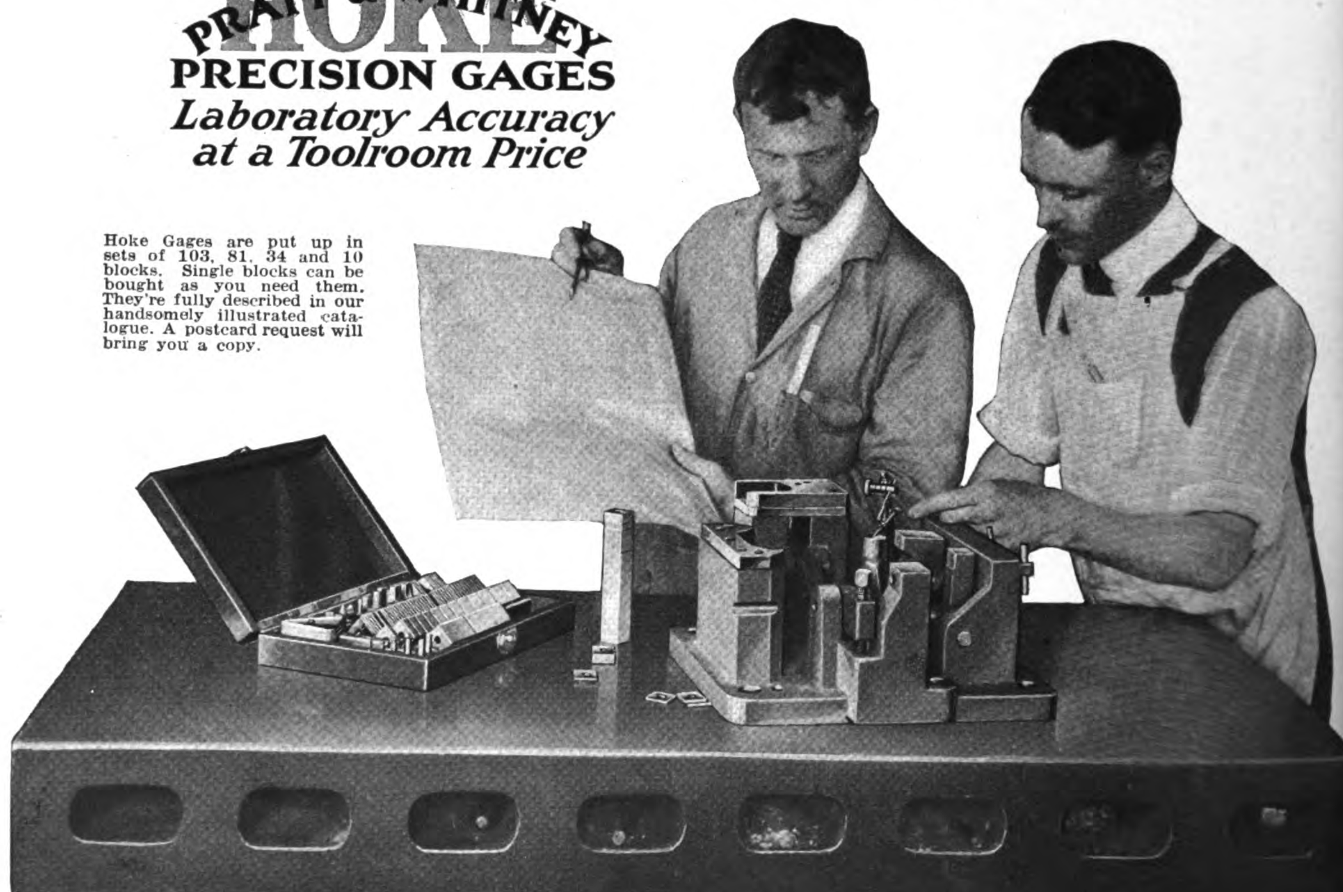

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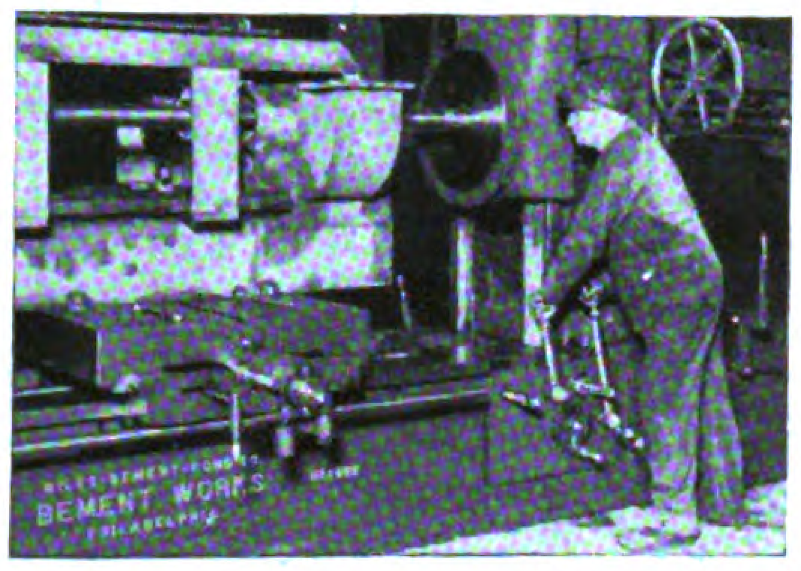

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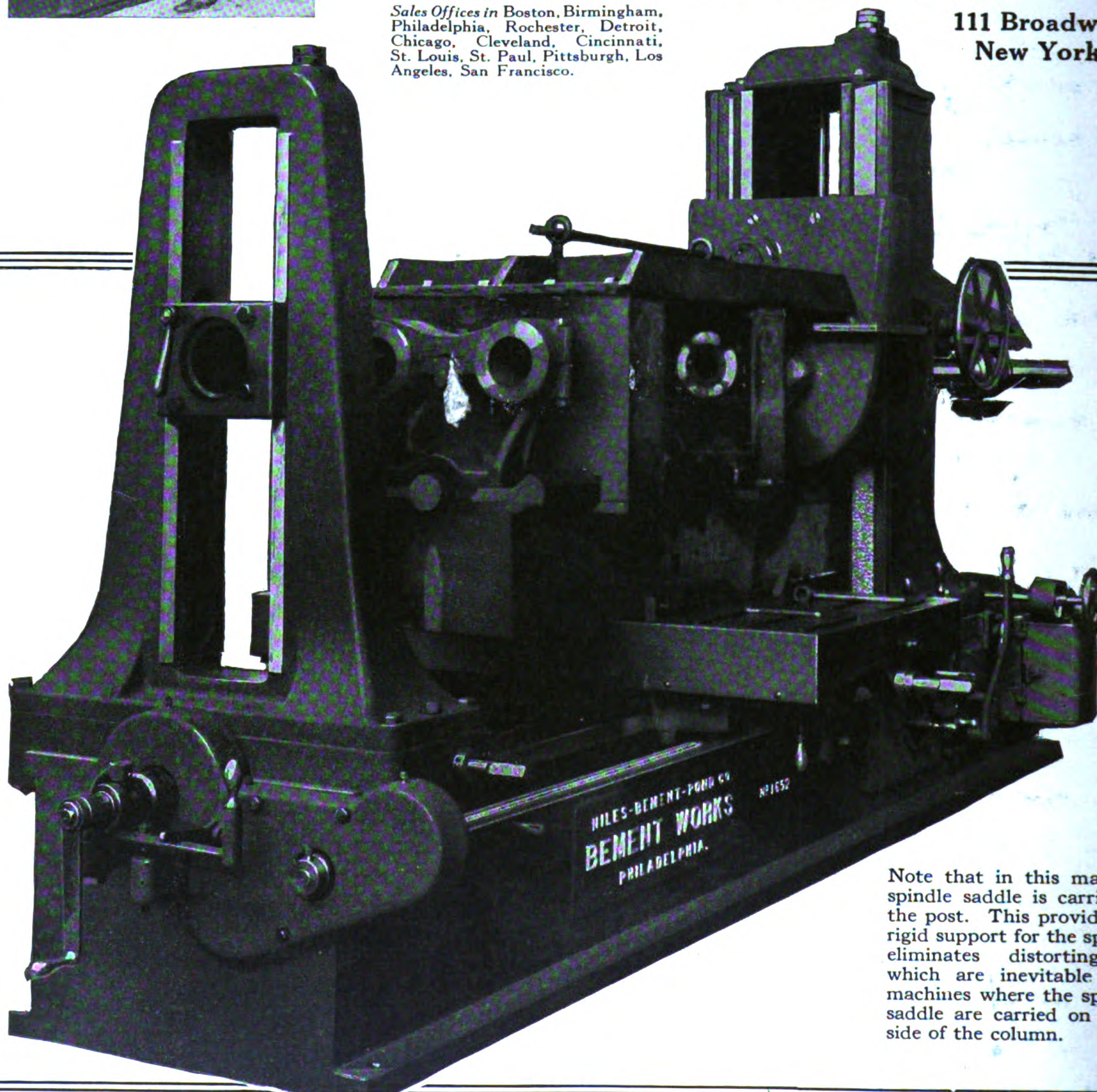


Note that in this machine the spindle saddle is carried *within* the post. This provides a most rigid support for the spindle and eliminates distorting strains which are inevitable in other machines where the spindle and saddle are carried on the front side of the column.

"DUPLEX CONTROL" N-B-P BORING DRILLING AND MILLING MACHINE

American Machinist

McGraw-Hill Company, Inc. April 27, 1922 25c. a copy

American Machinist

McGraw-Hill Company, Inc. New York 25 cents a copy

MAY 4, 1922

American Machinist

McGraw-Hill Company, Inc. New York 25 cents a copy

May 11, 1922

A drill that is rigid at every height

—*it's a* RIGHT-LINE RADIAL

THE column of the *Right-Line* Radial is of patented double beam section much stiffer than a circular section of the same weight. Because it swings with the arm it presents always the strongest section to the bending stresses set up during operation.

The arm and head are specially designed to bring the spindle unusually close to the face of the arm. Torsional moment is reduced to a minimum and the utmost accuracy in drilling is assured.

During operation, an electric clamp controlled from the head clamps the column to the pedestal, the arm is clamped to the column, the head to the arm. This locks the machine into one solid whole with a stiffness and rigidity that resists tendency to spring regardless of the position of the arm.

This built-in rigidity, unusual convenience of operation and an abundance of power permits fast, accurate drilling no matter how large the job.

Completely described in Catalog No. 247.

NILES-BEMENT-POND COMPANY

General Offices: 111 Broadway, New York City

Sales Offices in Boston, Birmingham, Philadelphia, Rochester, Cleveland, Cincinnati, Detroit, Chicago, Pittsburgh, St. Louis, St. Paul, San Francisco, Los Angeles.

404

American Machinist

McGraw-Hill Company, Inc. New York 25 cents a copy

May 18, 1922

Designers—note!

Forget that Worry About Center Distances

With Maag Spiral Gears the ideal tooth form is retained at any center distance.

No need to juggle your gear centers as is necessary when figuring with ordinary spirals. Maag Gears can be cut to fit exactly, any center distance you specify and will give on those centers any speed ratio your drawing calls for.

Or to put it another way—we can cut Maag Gears to exactly fit your design; you don't have to adapt your design to fit the gears. Keep this in mind the next time you figure on using a spiral drive.

MAAG GEARS

Catalog No. 265 tells you about Maag Gears —it is full of interest for every gear user.

NILES-BEMENT-POND CO.
General Offices—111 Broadway, New York.

American Machinist

McGraw-Hill Company, Inc. New York 25 cents a copy

BERWICK ELECTRIC RIVET HEATER

9 types and sizes for various needs

Capacities from 75 to 600 hot rivets per hour—¼" x 1" up to 1½" x 10" or larger

Send for this new catalog

It illustrates the various types and sizes of Berwick Electric Rivet Heaters; contains actual records of savings effected by Electric Heating, results of laboratory tests, and comments from users; and shows the latest developments of Electric Staybolt Heaters, Chain Heaters, Scarfing Heaters, Bolt Heading or Forging Heaters, etc.

You will hear more and more about Berwick Electric Heating

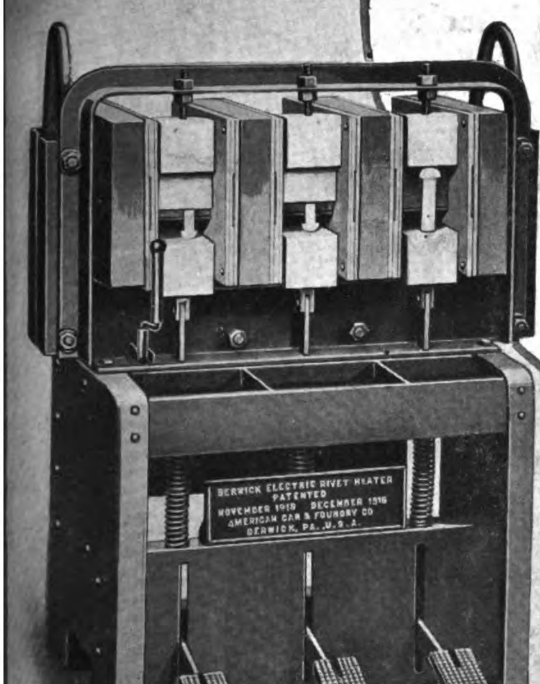


Illustration shows No. 3 Three-Electrode Berwick Heater for ⅝" to 1" rivets from 1" to 7¾" long Capacity 250 per hour maximum diameter

A postal card now will keep you posted

AMERICAN CAR AND FOUNDRY COMPANY

165 Broadway, New York

Railway Exchange Building, Chicago
915 Olive Street, St. Louis

May 25, 1922

American Machinist

McGraw-Hill Company, Inc. New York 25 cents a copy

June 1, 1922

Just fill the magazine—the machine does the re

THIS machine will cut production costs on four important classes of work—

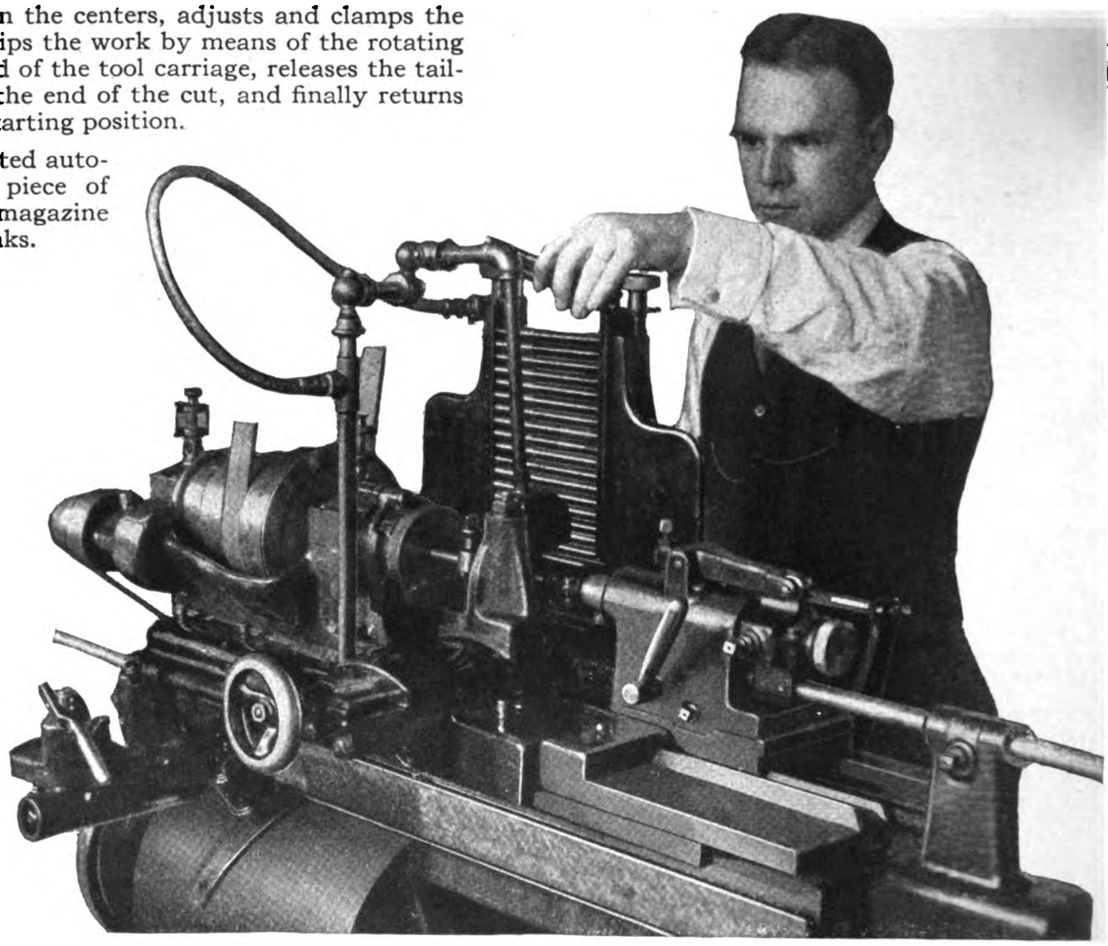
1. Work which must be done on centers such as drills, reamers and shafts which are subsequently ground on centers.
2. Any forging or casting of irregular shape which can be fed from the magazine.
3. Work which demands engine lathe accuracy.
4. Work done in such small quantities that it does not pay to set up a turret lathe or automatic screw machine.

PRATT & WHITNEY
FULL AUTOMATIC LATHE

After the first simple set-up it is only necessary to keep work in the magazine and regrind and reset in the holders the ordinary lathe tools that are used. The machine is entirely automatic in its action.

It places the work on the centers, adjusts and clamps the tailstock spindles, grips the work by means of the rotating chuck, starts the feed of the tool carriage, releases the tailstock and chuck at the end of the cut, and finally returns the carriage to the starting position.

Operations are repeated automatically for each piece of work so long as the magazine is supplied with blanks.



Catalogue No. 284 describes this machine and its operation. We will gladly arrange for demonstrations if desired.

Send us samples or blueprints for estimates of production.

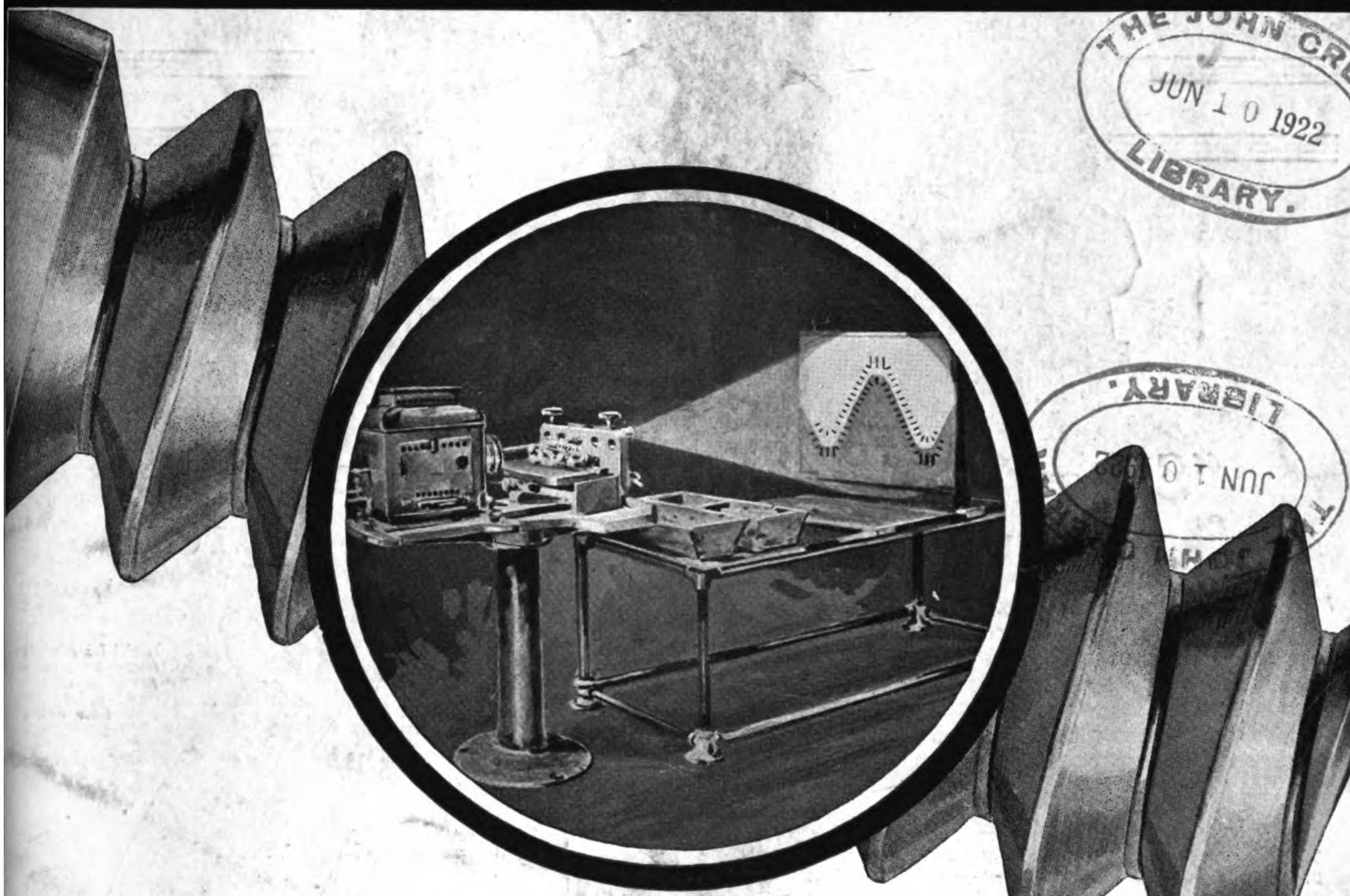
PRATT & WHITNEY COMPANY

Works: Hartford, Conn. **General Offices: 111 Broadway, New York**

SALES OFFICES: St. Louis Rochester Cincinnati Boston Birmingham Philadelphia St. Paul Cleveland San Francisco Pittsburgh Los Angeles Detroit Chicago

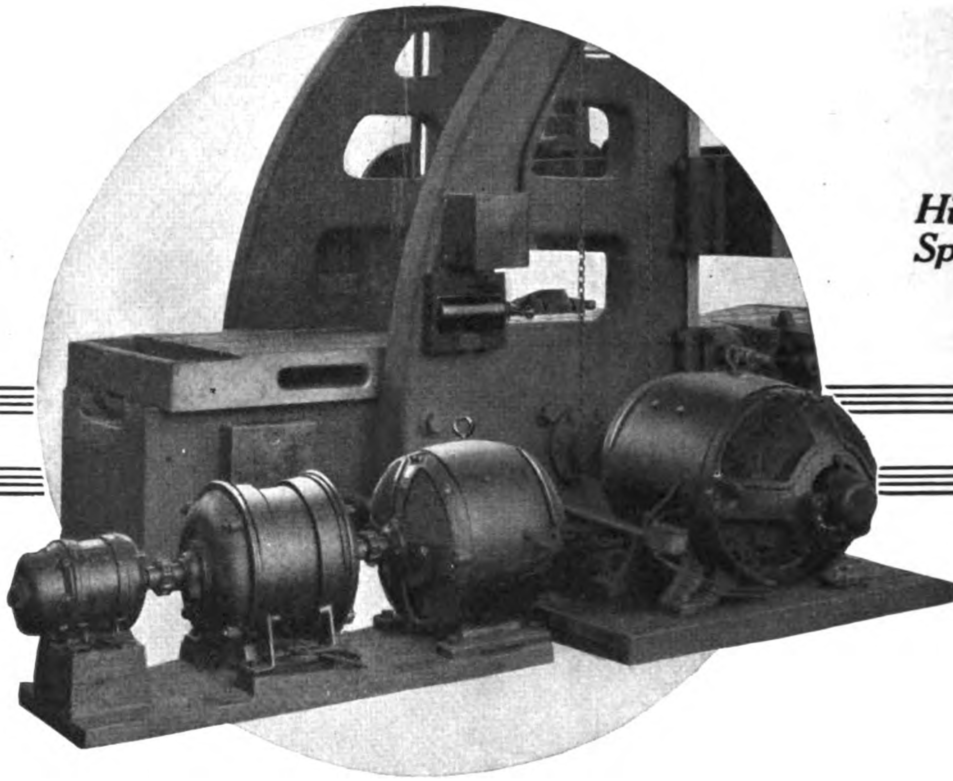
American Machinist

McGraw-Hill Company, Inc. New York 25 cents a copy



June 8, 1922

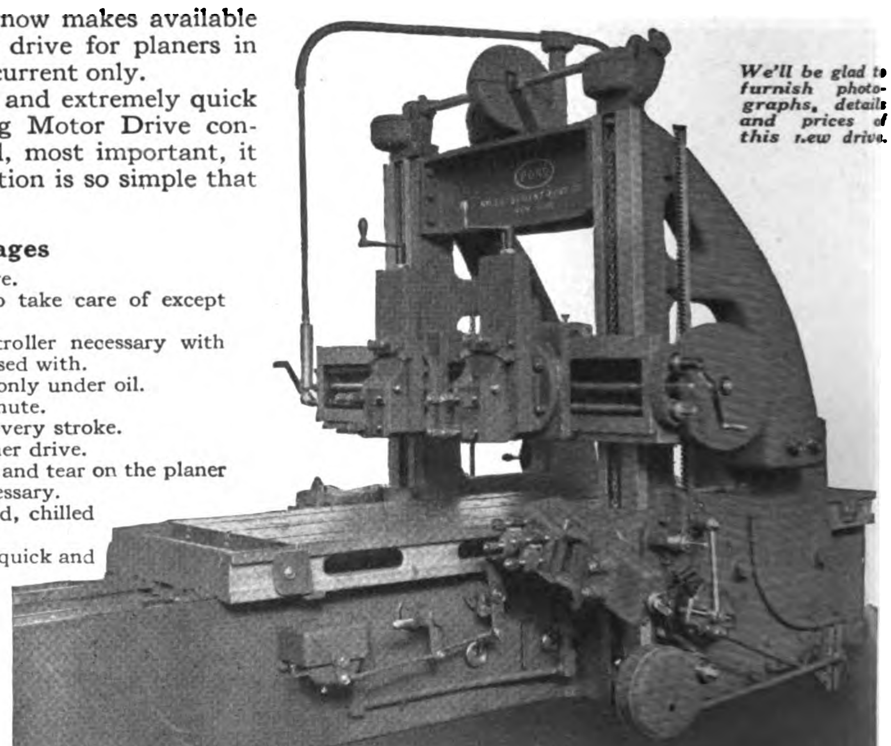
Quick Reversal



High Return Speed

"Super-Control" Reversing Motor Drive for *Alternating* as well as Direct Current

THIS newly developed planer drive now makes available the advantages of reversing motor drive for planers in those shops which are using alternating current only. Because of unusually high return speed and extremely quick reversal the "Super-Control" Reversing Motor Drive considerably increases planer output. And, most important, it is on the job continuously—its construction is so simple that troubles do not develop.



Summary of Advantages

1. Reliability greater than with any other drive.
2. Simple and easily understood—nothing to take care of except ordinary bearings and commutators.
3. Ease of control—complex automatic controller necessary with other types of reversing motor drive dispensed with.
4. Contacts cannot burn, circuits are broken only under oil.
5. High return speed—usually 165 feet per minute.
6. Extremely quick reversal—saves time on every stroke.
7. Accuracy of reversal—greater than any other drive.
8. Absence of shock at reversal—reduces wear and tear on the planer and makes a large number of clamps unnecessary.
9. Cutting speed as low as desired when sand, chilled castings, etc., are encountered.
10. High efficiency on short stroke work, due to quick and easy reversal.
11. Unused current returned to line instead of being used to heat resistance.
12. No danger of over-travel even if voltage fails.
13. Extremely quiet operation.
14. Increased production.
15. Can be arranged for either alternating or direct current.

NILES-BEMENT-POND COMPANY

General Offices: 111 Broadway, New York City

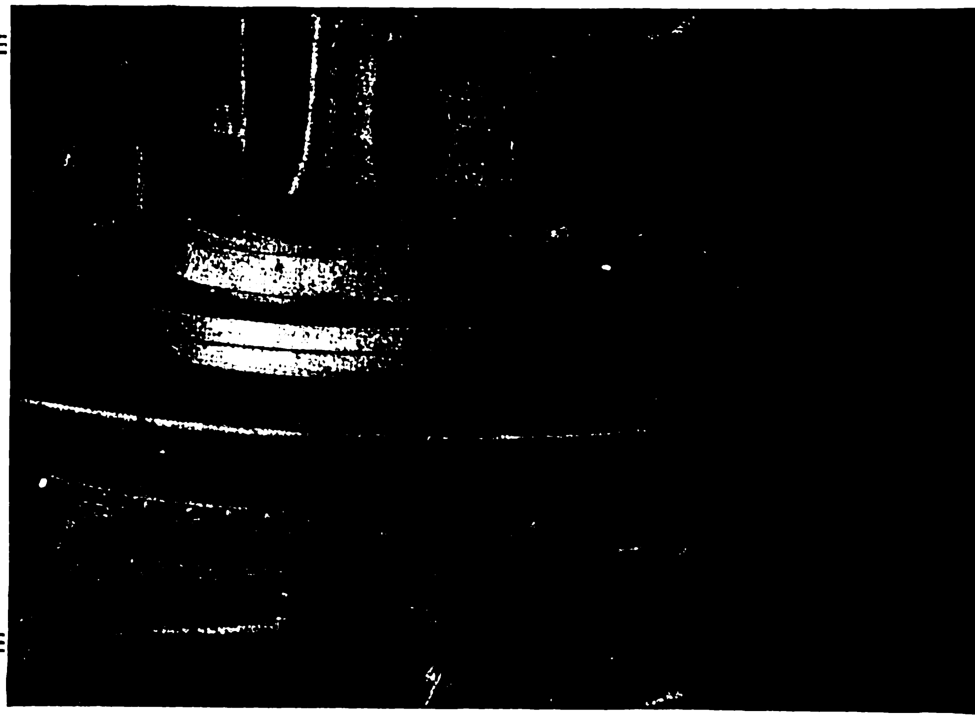
SALES OFFICES: Rochester Boston Philadelphia Cleveland Pittsburgh Detroit Chicago St. Louis Cincinnati Birmingham St. Paul San Francisco Los Angeles Seattle

American Machinist

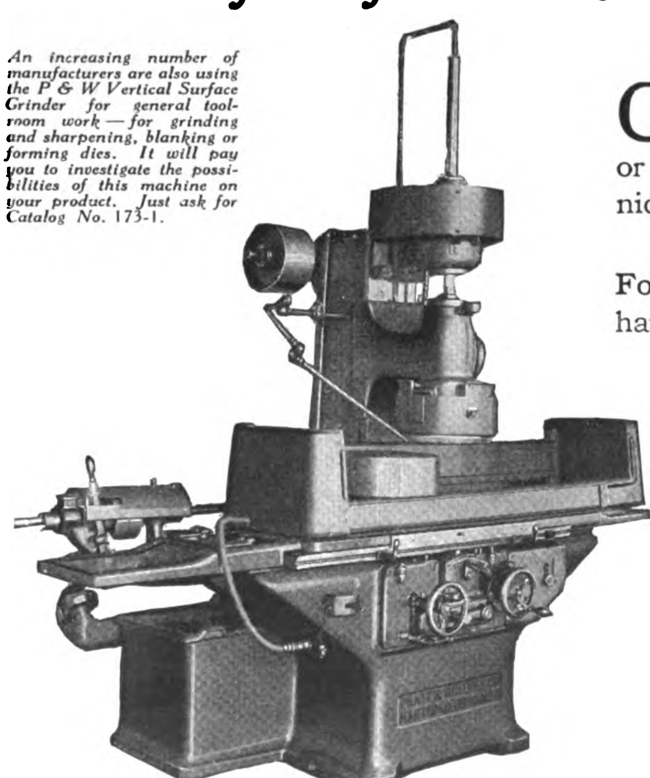
McGraw-Hill Company, Inc. New York 25 cents a copy

June 15, 1922

P & W VERTICAL SURFACE GRINDER



The only way to finish this work is to grind



An increasing number of manufacturers are also using the P & W Vertical Surface Grinder for general tool-room work — for grinding and sharpening, blanking or forming dies. It will pay you to investigate the possibilities of this machine on your product. Just ask for Catalog No. 173-1.

GRINDING Vacuum Cleaner and blower parts. The blades are too delicate to mill or cut, so they use the Grinder that gives a nicely cut, parallel face.

For such work the rotary chuck comes in handy. When needed; the planer-like rectangular table can be used for other work with equal efficiency.

The Pratt & Whitney Vertical Surface Grinder is a double-purpose machine; ready to give accuracy on one job or to take the place of the milling machine or planer in cleaning and truing up a face without springing or distorting the piece.

PRATT & WHITNEY COMPANY

WORKS—HARTFORD, CONN. **General Office: 111 Broadway, New York**

Sales Offices in Boston, Birmingham, Philadelphia, Pittsburgh, Detroit, Cleveland, Cincinnati, Rochester, Chicago, St. Louis, St. Paul, San Francisco, Los Angeles.

American Machinist

McGraw-Hill Company, Inc. New York 25 cents a copy

"Hercules"

In open competition, and in day-after-day use in factories everywhere, Whitman & Barnes "Hercules" High Speed drills have proved their higher efficiency and lower cost over and over again.

Instances where the use of "Hercules" has increased production, 75 and 100% are common. The striking thing about many of these records is the fact that they were made on jobs that had offered prohibitive difficulties.

W&B

The works in which Whitman & Barnes drills and reamers are produced have always been the last word in mechanical equipment.

In these works, too, the human skill which enters into the manufacture of these precise tools, finds, we believe, its highest expression.

These remarkable facilities are, of course, undergoing a continuous process of refinement, improvement, and enlargement.

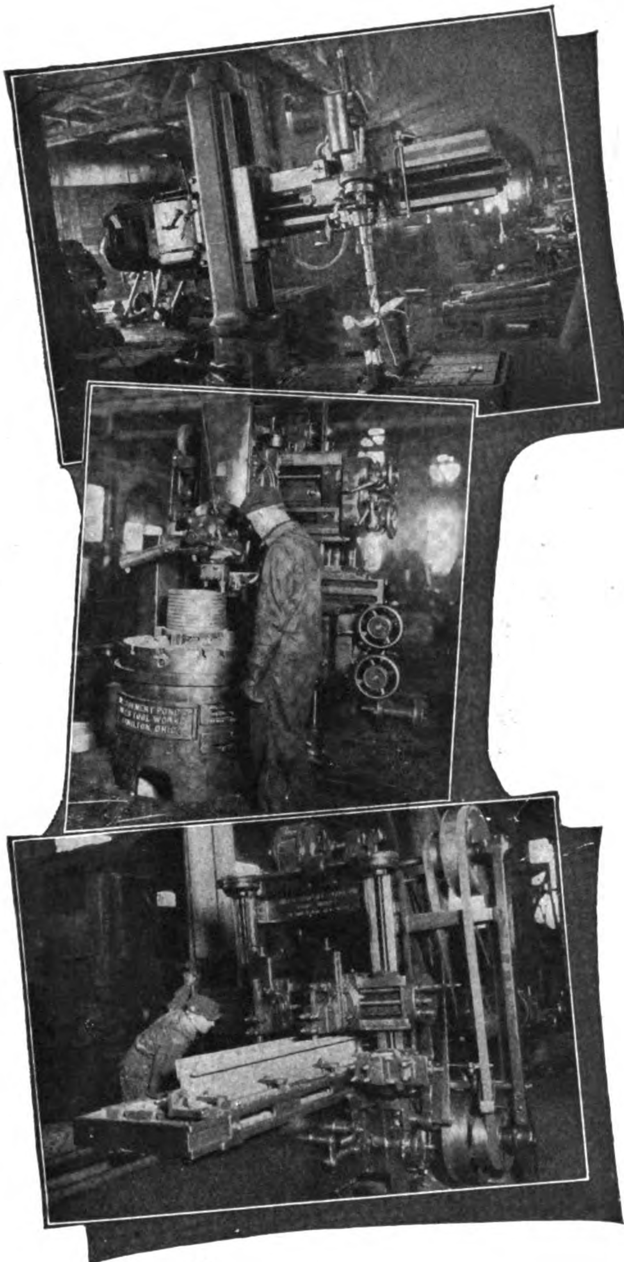
The last two months, for instance, have seen new additions of machinery, which still further emphasizes the leadership of Whitman & Barnes among manufacturers of twist drills and reamers.

Warehouses
64 Reade Street, New York City
565 W. Washington St., Chicago, Ill.
139 Queen Victoria St., London, E. C. 4

Whitman & Barnes

AKRON, OHIO
Manufacturers of **TWIST DRILLS AND REAMERS** *Exclusively*

June 22, 1922



A Machine Tool
Service Station

For Railway Shops, Shipyards, General Manufacturing and Repair Plants—

INTO the eventful history of railway, marine and motor transportation has been written the Niles-Bement-Pond story of service; in the growth of factory, mine and mill, it is recorded with equal permanence. For fifty years we have concentrated on the production of dependable tools and equipment.

Our eight factories, greatly enlarged and re-equipped within the past few years are today manufacturing our extensive line of standard products to serve all your machine tool needs.

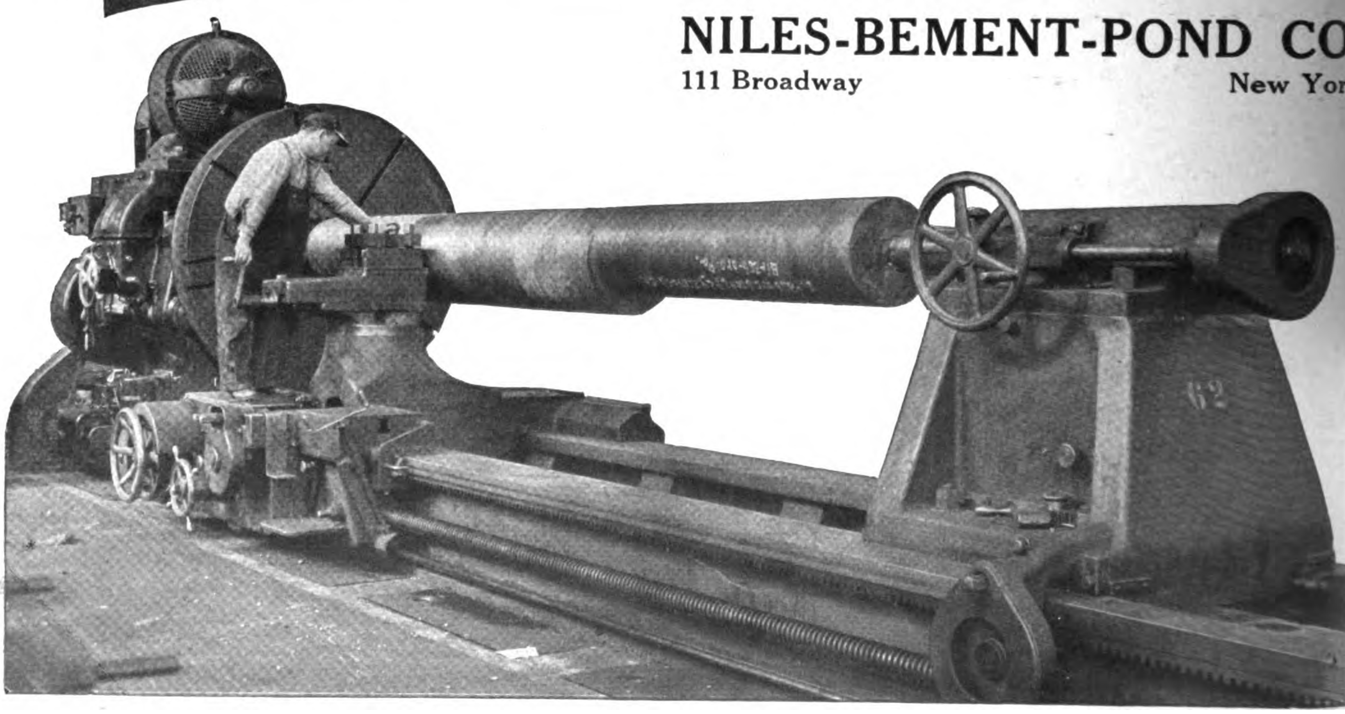
We are prepared to furnish complete machine tool, small tool, gage and crane equipment to cover the needs of every shop working metal.

Whatever your requirements—whether for existing equipment or for tools of special design—our Engineers will furnish dependable counsel, plans or estimates. Their services are at your disposal.

We have Offices in Boston, Rochester, Birmingham, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Detroit, St. Paul, St. Louis, San Francisco, Los Angeles. Call the nearest one when you are in a hurry.

NILES-BEMENT-POND CO

111 Broadway New Yor



American Machinist

McGraw-Hill Company, Inc. New York 25 cents a copy

June 29, 1922

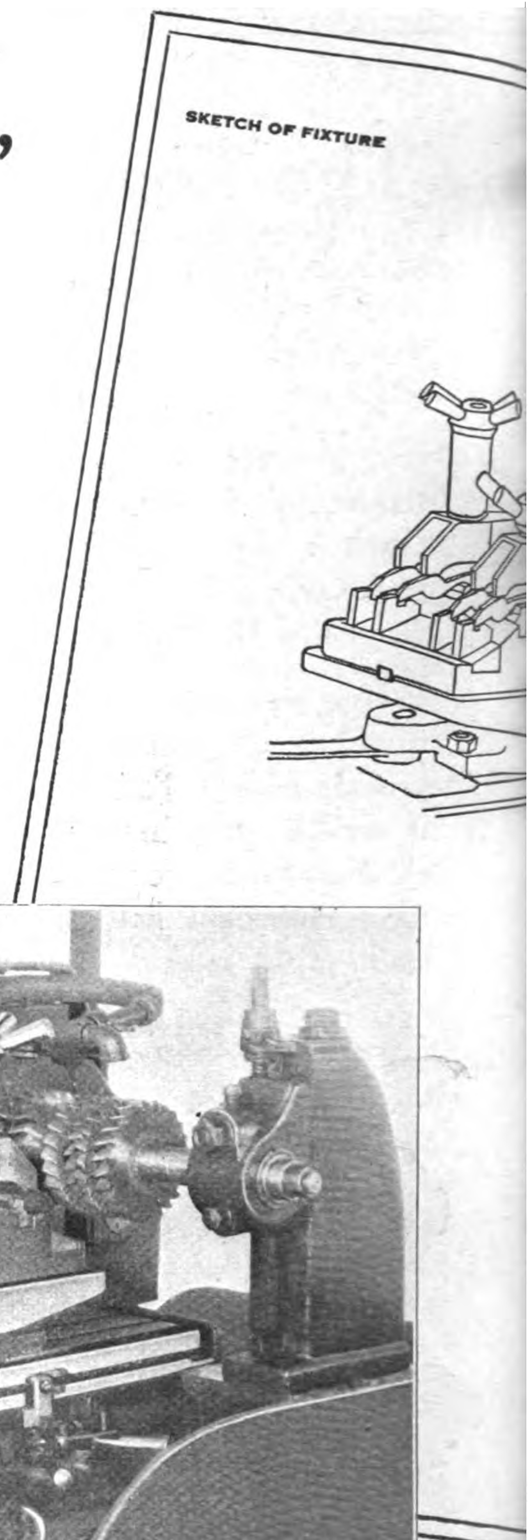

"NATIONAL"
BULLETIN
CORRECT PIPE THREADING PRINCIPLES

"How would you suggest that we handle this job?"

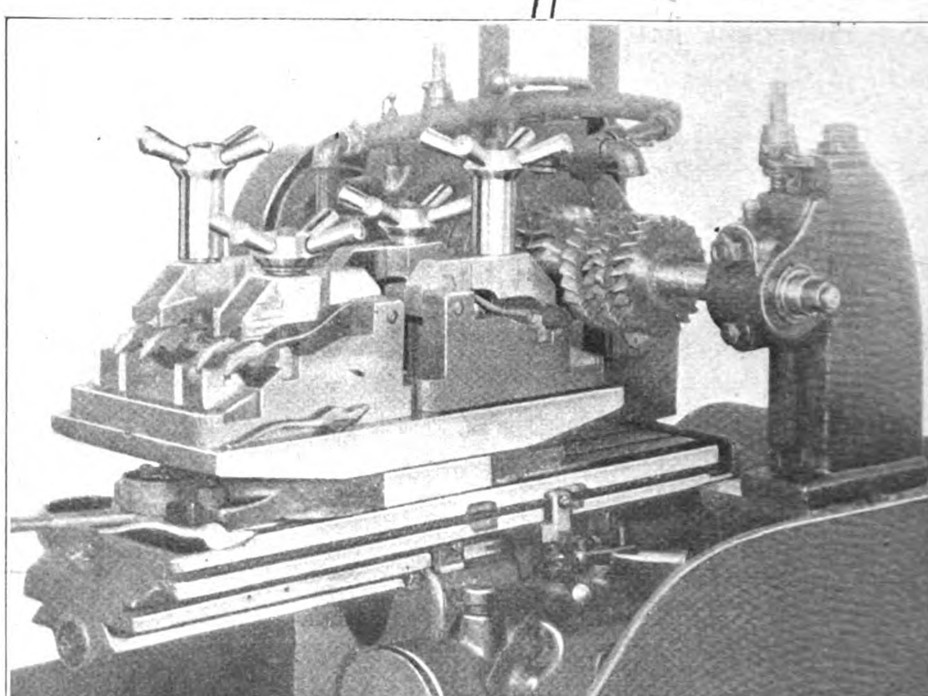
This is a typical case of Cincinnati Milling Engineering Service.

The problem was to find a cheaper way to mill plier sides. A sample of the piece and a blueprint accompanied the request for our Engineering Service. We made a thorough study and analysis of the job, prepared an estimate (as illustrated), and upon its acceptance provided the equipment. The resulting production was 20% in excess of our estimate.

Remember, this is not an exceptional case. We can do as well for you. Ask us to try.



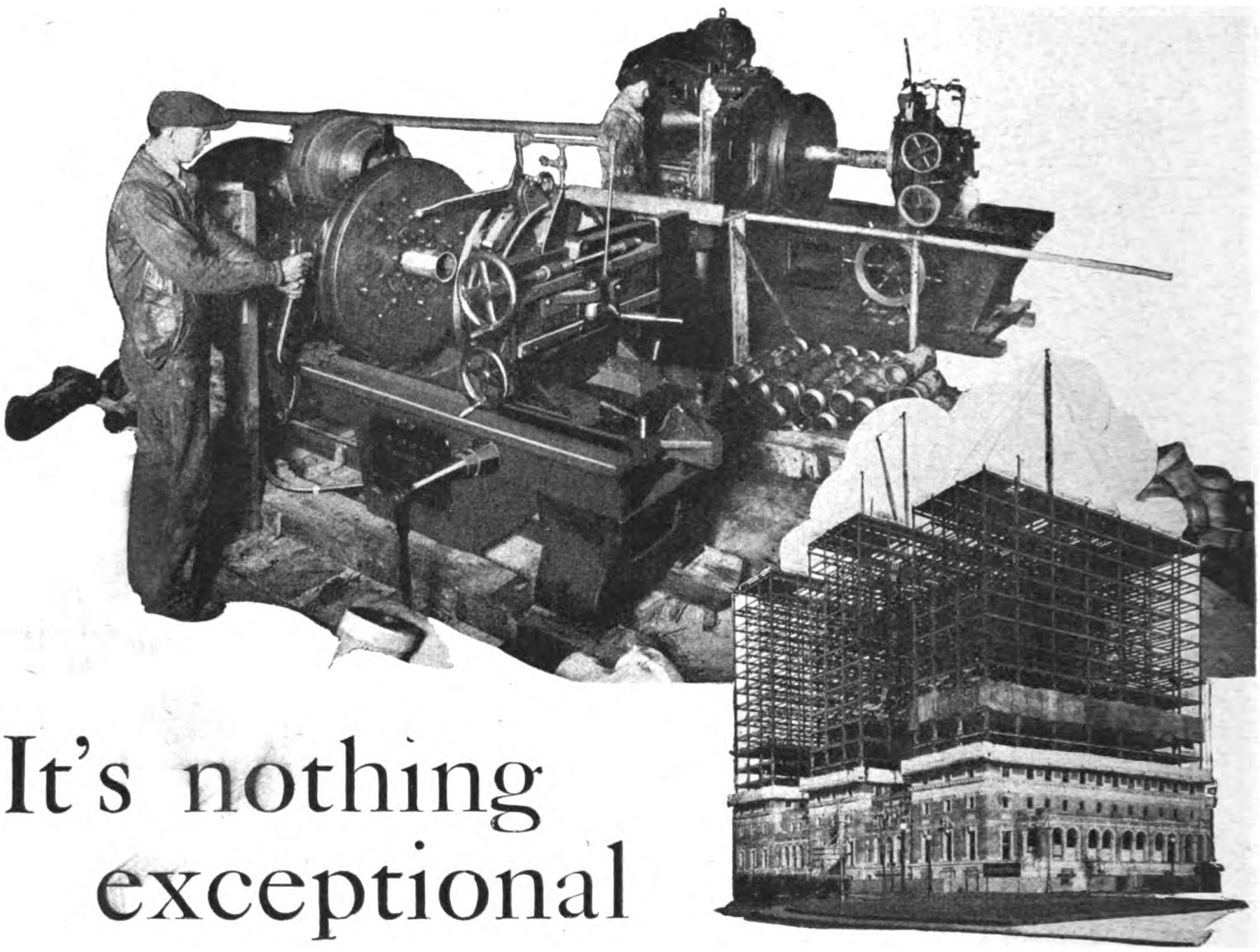
Here is the finished job. This equipment actually produces about 20% more than our engineers claimed it would.



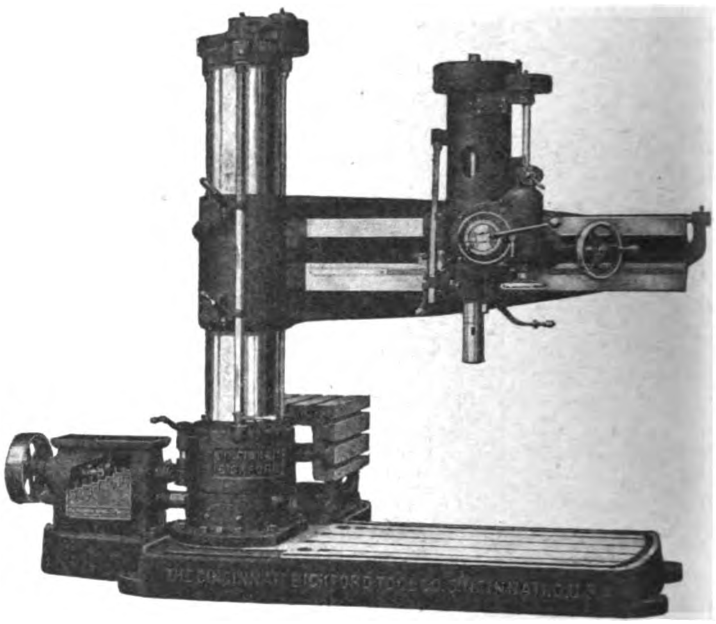
24 in. Cincinnati Plain Automatic with Index Base and Special Fixtures.

The Cincinnati Milling Machine Co.

Cincinnati, Ohio, U. S. A.



THE CINCINNATI BICKFORD



4-,5-and 6-foot Plain Radial Drilling Machine

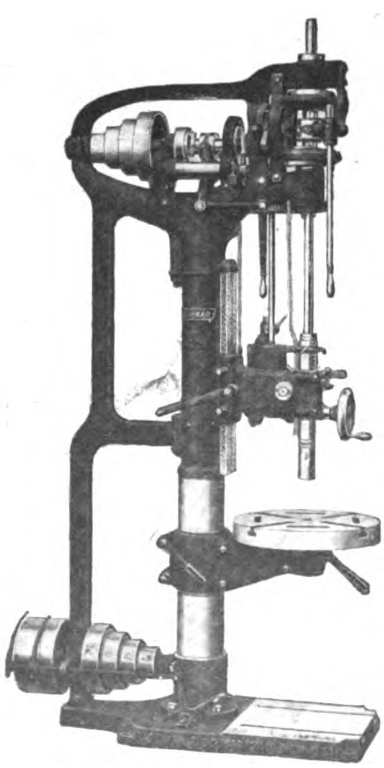
The growing value of time can be traced in the evolution of *Cincinnati Bickford* Radial Drilling Machines from their original form to their present highly developed types.

This machine requires a minimum number of operations in drilling a hole. Those operations that are required have been developed so as to take a minimum amount of time—one result of our years of experience and concentrated effort.

The Cincinnati Bickford Tool Company

Oakley, Cincinnati, Ohio, U. S. A.

Founded 1874



THE CINCINNATI

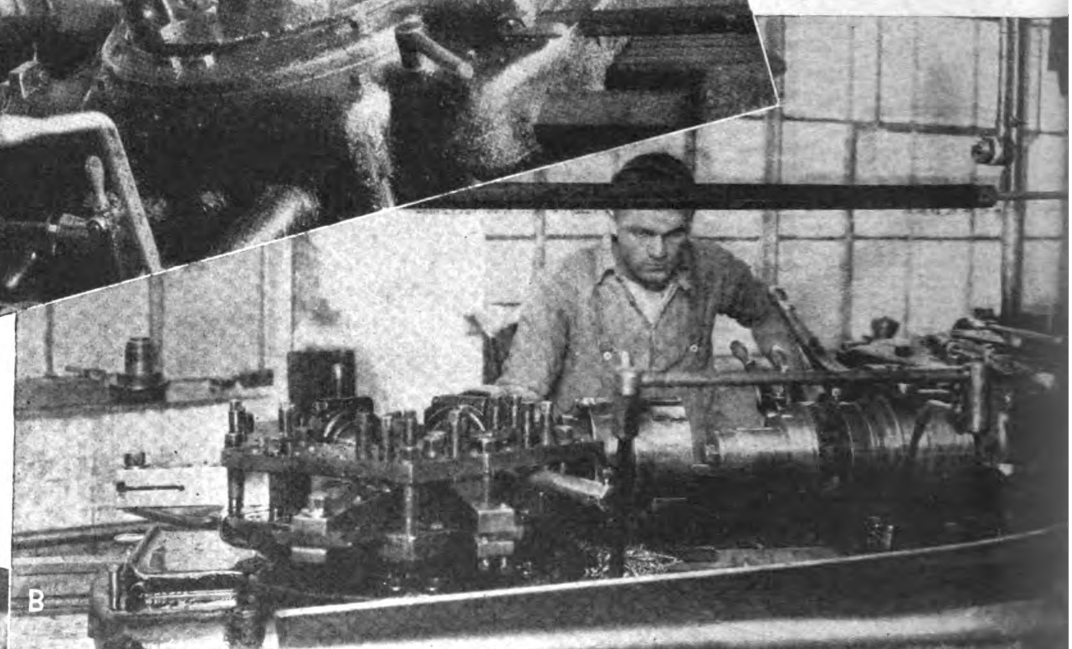
Gives You the Benefit of 48 Years' Experience

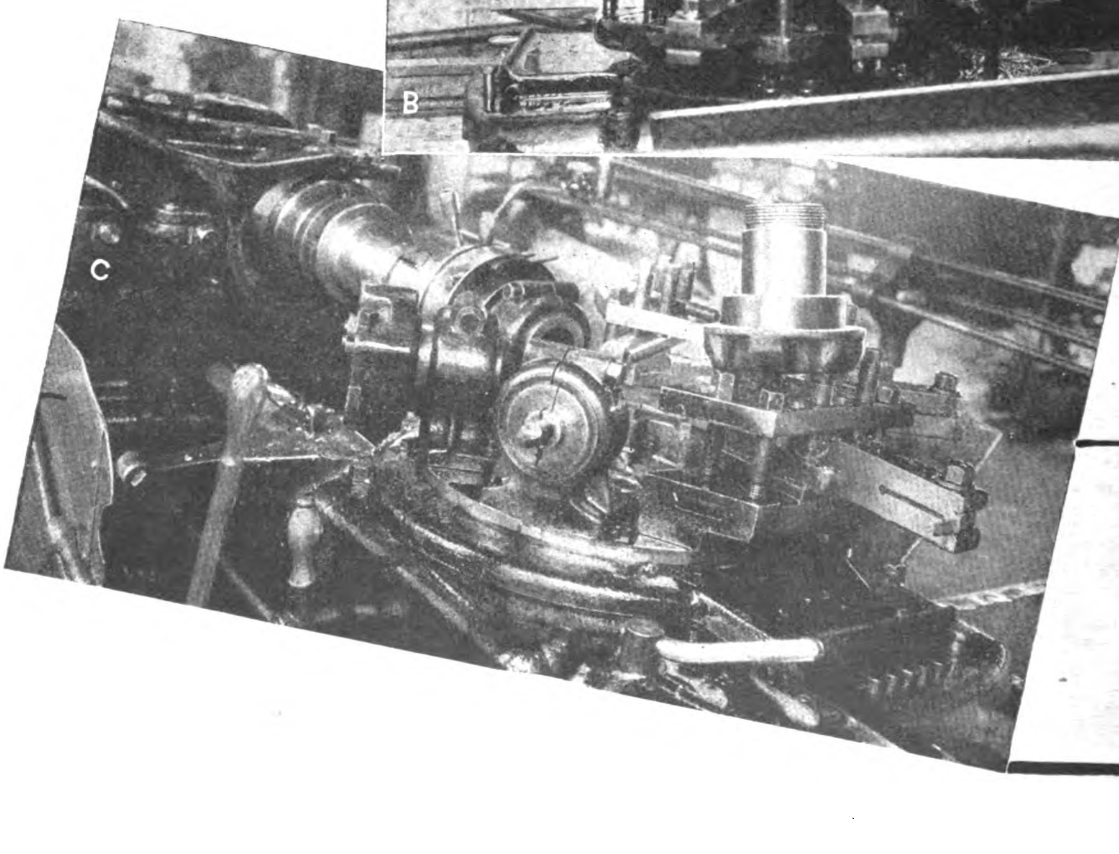
We have been manufacturing drills for over forty-eight years. The refinements of design and construction that characterize our machines come as a result of great care and much costly experimentation on our part. Every user of a *Cincinnati profits by our experience.*

The machine shown is our 21-inch, Sliding Head, Heavy Pattern Drill. The Patent Geared Tapping Attachment is furnished or not as desired. These drills have many excellent features that will help reduce your drilling costs.

No 6

The HARTNESS FLAT TURRET LATHE *at work*



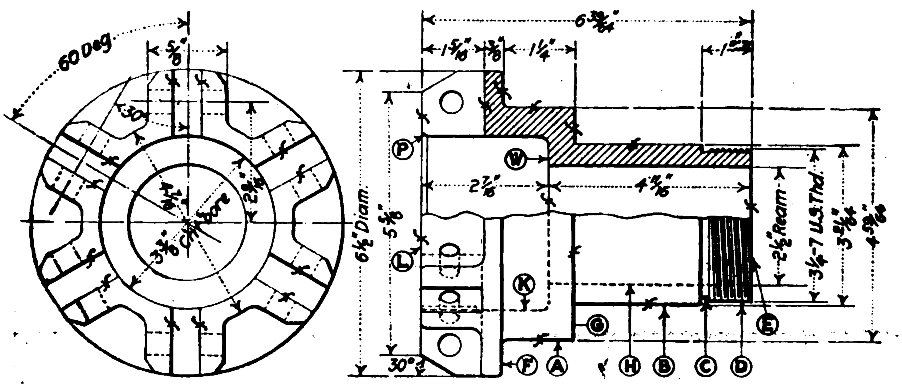


When you buy a "Hartness"—you get *production*—not merely a machine.

’roducing with a “Hartness”

Finishing a Friction Hub

in a shop where 100 Hartness Flat Turret Lathes are giving satisfaction



The work illustrated is machined from a steel casting. Each piece is finished in two operations. This work is being produced on Hartness Flat Turret Lathes in the shops of Sullivan Machinery Co., Claremont, N. H., where 100 Hartness Flat Turret Lathes are giving satisfaction.

Illustration A (opposite page) shows the first operation on the hub.

In the first position on turret—Rough bore K
In the second position on turret—Face L
In the third position on turret—Rough bore H
In the fourth position on turret—Finish bore H
In the fifth position on turret—Bore K, bevel P, and face W
In the sixth position on turret—Ream H
In the first position on turret—Face E

Illustrations B and C (opposite page) show the second operation on the hub.

In the second position on turret—Rough turn A and B

In the third position on turret—Face F and G, and neck C

In the fourth position on turret—Finish turn, A, B, and C.

In the fifth position on turret—Thread D

If you have work similar to this, we would like to furnish you with time estimates and production figures.

Hartness Flat Turret Lathes have many advantages to recommend them. In these days of keen competition, work must be done profitably and at a close figure. Production speed is an important factor, yet accuracy must be maintained. You get both on a “Hartness” and save on labor. This means economical production at a minimum cost. These are the conditions under which the Hartness Flat Turret Lathe is producing satisfactorily. You want production—you'll get it on a “Hartness.”

Tell us what your problem is and we will show you how it can be done faster and more economically.

JONES & LAMSON MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.

503 Market St., SAN FRANCISCO, CAL. **9-10 Water Lane, Queen Victoria St., London, E. C.**

AGENTS

France, Spain and Belgium. F. Auberty & Company, 182 Rue Lafayette, Paris
Holland: Spliethoff, Beeuwkes & Company, Leuvehaven Wz. 159, Rotterdam, Japan, Korea, etc.; Mitsui & Company, Ltd., Tokio, Australasia: McPherson's Pty., Ltd., 554 Collins Street, Melbourne. Sweden: A. Bol. Oscar Lindbom, Stockholm.

A Little Walk

Through Your Own Shaper Department

Just to start the ball rolling, consider the cost per operation in your planer department. You may be amazed in comparing the efficiency of a shaper built in 1910 or 1900, with an up-to-date model, designed to meet modern conditions.

Possibly you will find no conditions as serious as in the shop where the photo below was taken. That shop is actually using the 21-in. shaper shown by the illustration, and trying to compete with other shops employing up-to-date machinery. The machine referred to is 26 years old, of obsolete design, badly worn, inaccurate, and when photographed was taking a cut in steel 1-16 deep, with a .015 in. feed, at 22 strokes per minute. Small wonder that costs are high—Nor is this an unusual exaggerated case.

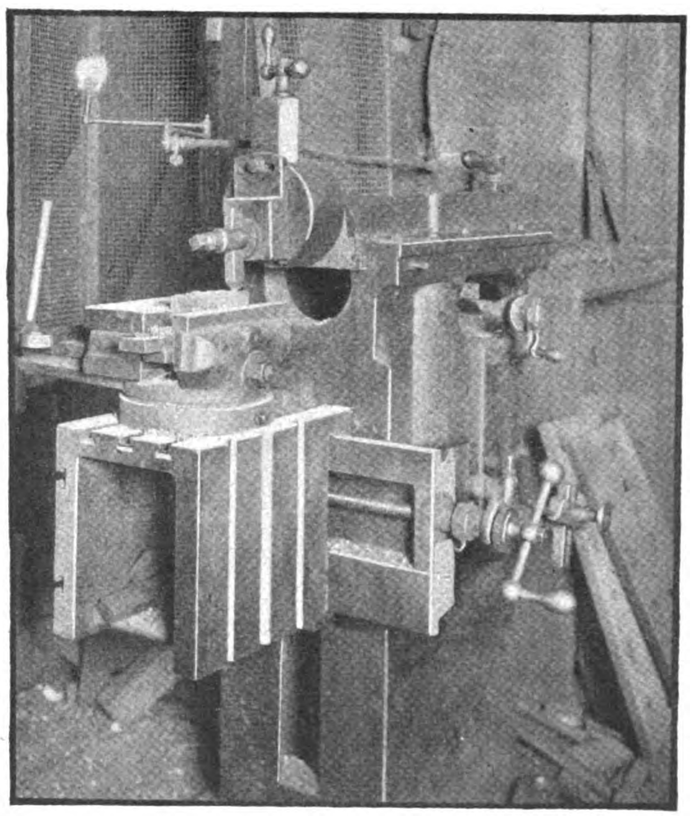
Increasing Production 4800%

Compare this with a new "American" shaper of the same size, which does the same work at ½ in. depth of cut, with a .093 in. feed, at 22 strokes per minute—an increase in production of 48 times, and, what is more, the work is accurate.

There are in this country thousands of antiquated shapers of low productive value, which simply must be eliminated and replaced with new and better tools before manufacturers can expect to get their costs and selling prices down to a basis attractive to the buyer. Are any of them in your plant?

Let "AMERICAN" engineers help you check up this proposition

Let each manufacturer analyze his own conditions, and wherever he finds a cost leak, let him take immediate steps to correct it. That is something we all have got to do if we intend to remain in business, for if we don't do it our competitors will; then what chance will we have? Let's look the facts in the face and get busy.

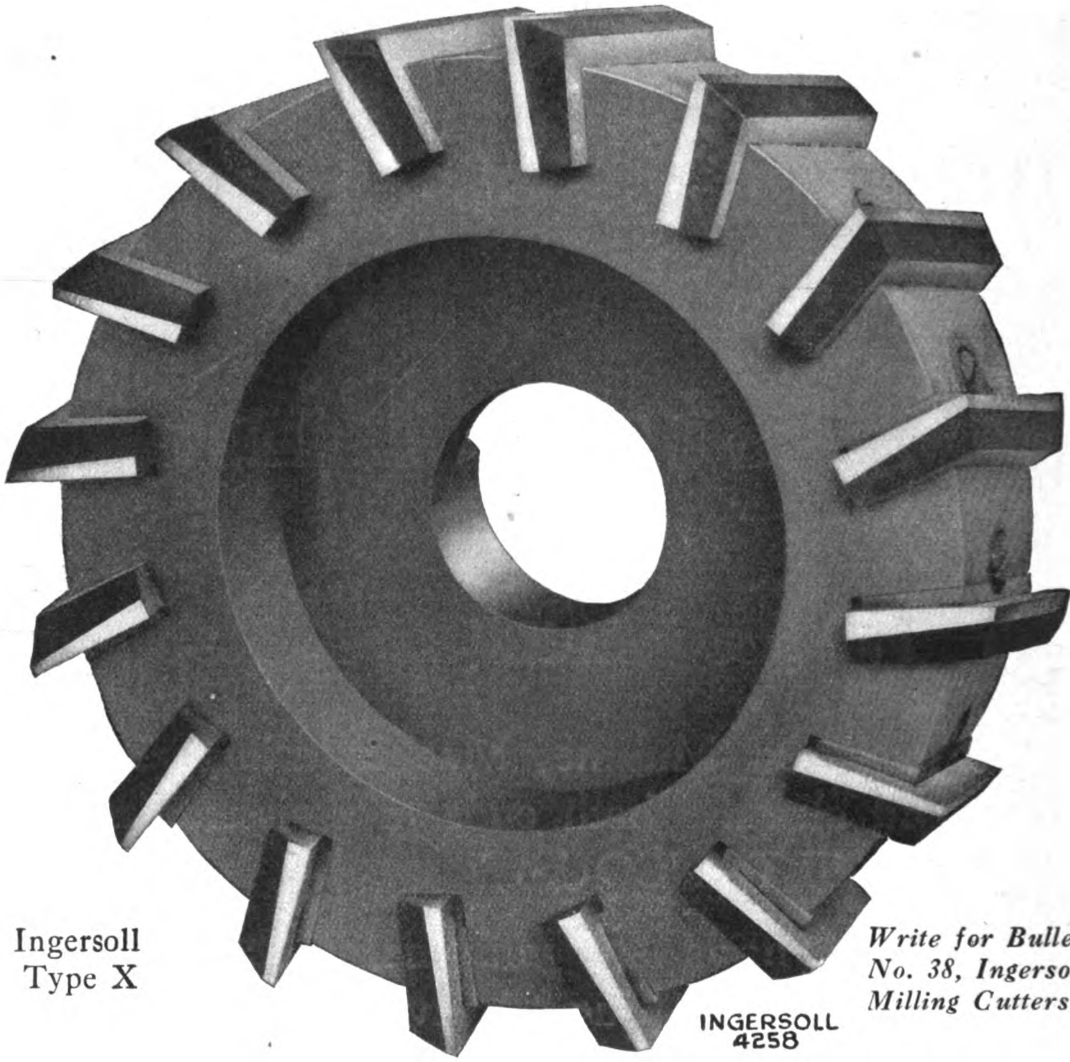


ompany, Cincinnati, U. S. A.

Shapers ***Radials***

INGERSOLL

Take Heavier Cuts With Ingersoll Cutters



Ingersoll
Type X

Write for Bulletin No. 38, Ingersoll Milling Cutters

The Inserted Tooth Milling Cutter is an Ingersoll specialty developed through thirty-six years of experience devoted exclusively to milling.

There is an Ingersoll Cutter for every type of milling. The type "X" cutter is designed for heavy duty milling in steel or cast iron. It is the best cutter for all around shop work that we know of. It is especially adapted to work requiring a cutter that will mill on the periphery as well as the face. The teeth are of high speed steel, held firmly in place by wedges and screws. The housing is a hardened steel forging.

Through the utmost efficiency in producing Ingersoll inserted tooth cutters in standard sizes, and large quantities, we have been able to reduce our cutter prices to the 1914 level. Let us have your cutter inquiries. We can make immediate delivery on all standard Ingersoll cutters. Present prices will warrant your making necessary purchases.

The Ingersoll Milling Machine Co.

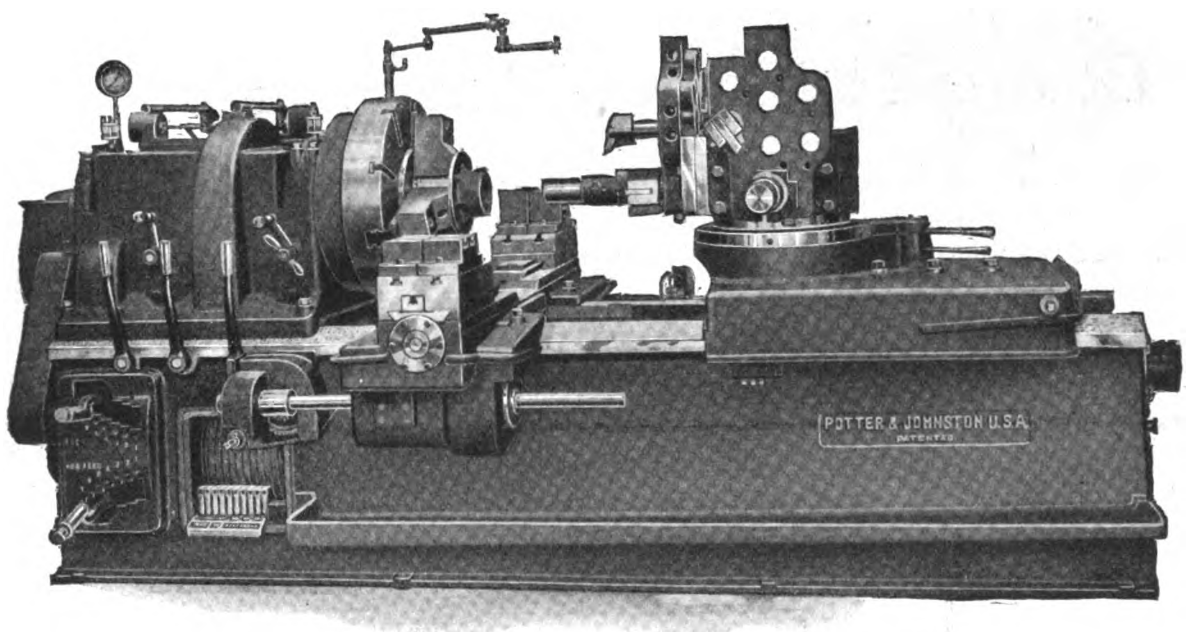
Milling Machines and Their Equipment

Detroit: David Whitney Bldg. ROCKFORD, ILL. 50 Church St., New York

You Getting Accuracy With Production?

If you are getting both you may be interested in a way of improving your present method of machining and thereby jumping up your production and at the same time retaining your accuracy.

If you are not getting both you should investigate the proposition right away and get on the track to improve your methods of manufacture. Send your drawings or samples along and we will outline what we can do for you.



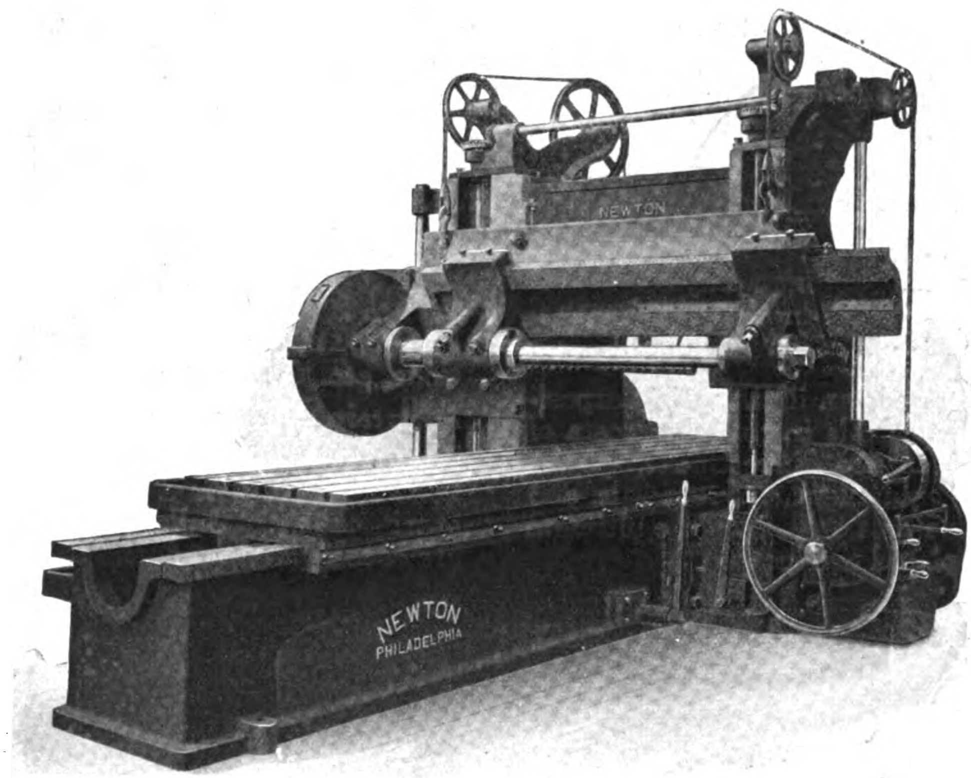
JOHNSTON
RHODE ISLAND

Foreign Offices and Representatives: Office for Great Britain, France, Italy, Belgium, Switzerland, Spain and Portugal; Potter & Johnston Machine Co., 68 Ave. de la Grande Armee, Paris, France, J. Ryan, Manager. Chas. Churchill & Co., Ltd., London, Birmingham, Manchester and Newcastle-on-Tyne, England, and Glasgow, Scotland. Ercole Vaghi, Corso Porta Nuova, 34 Milan, Italy, Rylander, & Asplund, Stockholm, Sweden, Yamatake & Company, No. 1 Yurakucho, Ichome, Kojimachiku, Tokyo, Japan.

NEWTON

(Registered Trade Mark)

HORIZONTAL MILLING MACHINES



NEWTON MILLING MACHINES

have the WEIGHT and SURPLUS POWER which eliminate vibration and insure steady, smooth cutting, together with the necessary feed, speed and control mechanism to give MAXIMUM PRODUCTION AT MINIMUM COST.

IMMEDIATE SHIPMENT can be made on several sizes. Care to have specifications?

NEWTON MACHINE TOOL WORKS, Inc.

MILLING MACHINES

Manufacturers of
SLOTTING MACHINES
ROTARY PLANING MACHINES
CRANK PLANING MACHINES

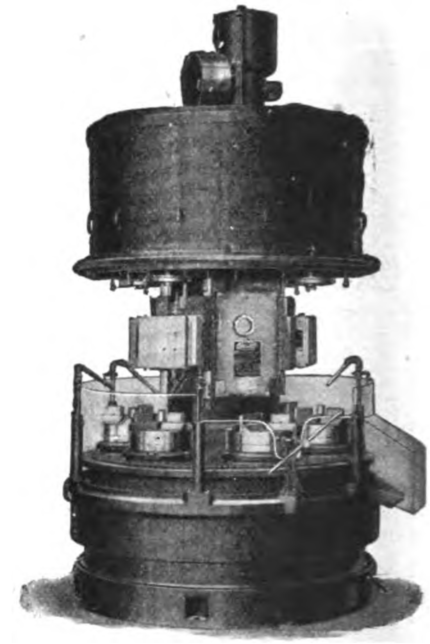
COLD METAL SAWING MACHINES

23rd and Vine Streets **Philadelphia, U. S. A.**

Economizing

by the trainload is possible with the

BULLARD Mult-Au-Matic



Bullard Mult-Au-Matics transformed carload production to trainload production in the plant of a middle west automobile manufacturer and the best part of the story is the decrease in labor costs with less equipment and floor space required.

A comparison of records showed a trainload production credited to the Mult-Au-Matics against four carloads for the same period with equipment supplanted by the Bullard machines.

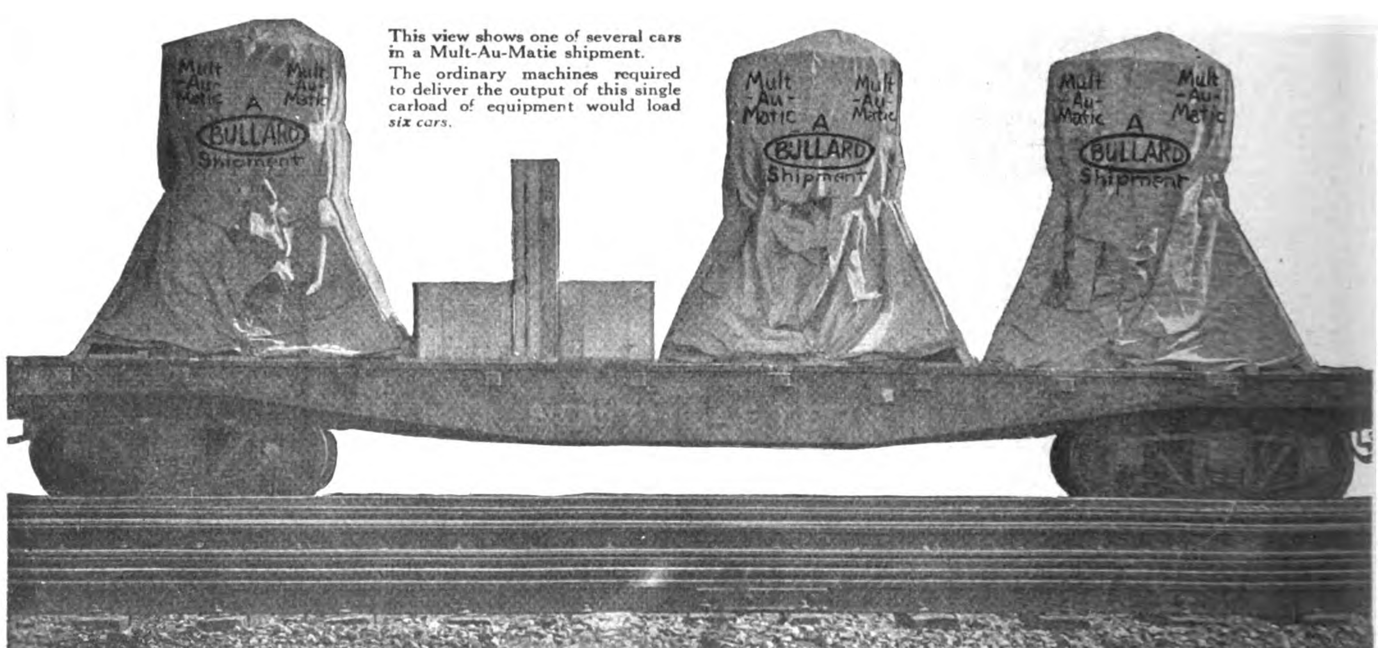
The Mult-Au-Matic is a simple combination of six vertical lathes, requiring only one operator, and equaling in production the best records of six to ten well-tooled machines.

The complete story is an illuminating exposition of modern methods in reducing costs of overhead, maintenance, investment, power equipment, tool equipment and renewals, and many other items that enter into the ultimate cost of the completed product.

The scope of the Mult-Au-Matic includes all classes of castings, forgings, and bar stock (cut to lengths) which require boring, facing, turning, threading, drilling, tapping operations, etc., either singly or in combination.

Ascertain whether or not your work comes within the range of this machine.

Send blueprints or sample pieces with finish specifications. Bullard Engineers estimates are conservative and reliable.



This view shows one of several cars in a Mult-Au-Matic shipment. The ordinary machines required to deliver the output of this single carload of equipment would load *six cars*.

The Bullard Machine Tool Company

Bridgeport, Connecticut, U. S. A.

Builders of the Mult-Au-Matic, the Vertical Turret Lathe and the Maxi-Mill.

"Why can't they all be like this?"

Scores of boiler makers have pondered this question after noting Brubaker stay bolt tap performance.

All taps could be like Brubaker's if all manufacturers used the same care in material selection and fashioning and possessed the Brubaker tempering process.

Brubaker stay bolt taps are made of the best grade of steel; they have a Special Relief that assures a clean shearing cut; are tempered to such a scientifically correct degree that highest motor speeds are possible.

The taps in every shipment are true to size and will give a full 20% longer service life than taps of other make.

If you are looking for more and better tapped holes per shift your search will end with Brubaker Taps.

W. L. Brubaker & Bros. Co.

50 Church St., New York

Factory, Millersburg, Pa.

The Tap with the "Continuous Taper"

A method by which you can't tell where the taper thread enters the straight thread, thereby producing a uniform cutting edge which distributes the work.

What the Shows Showed

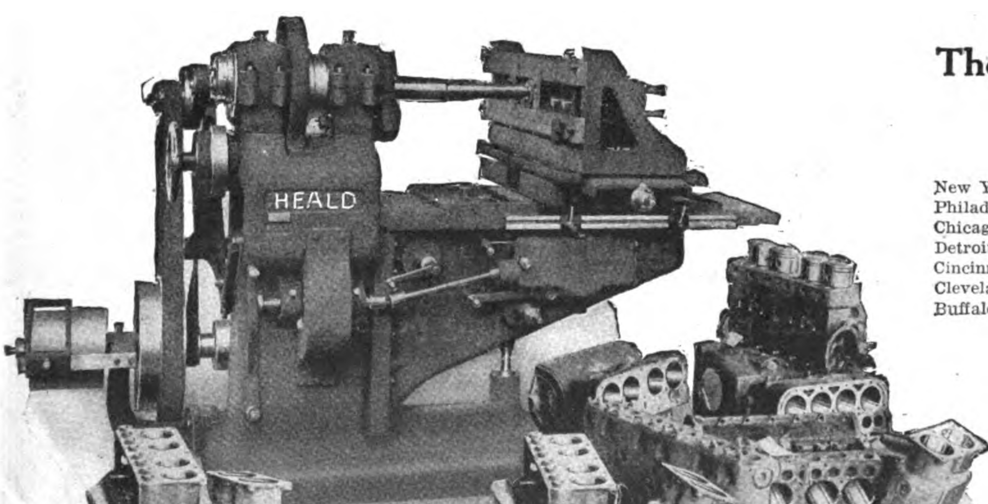
Ninety-five per cent of those who approached the HEALD Booths at the New York, Philadelphia, Chicago, Minneapolis, Tampa, Atlanta and St. Louis shows were automobile owners, when they saw the HEALD in operation and the work they turned out, they quickly recognized the advantages of a reground cylinder and inevitably ask for the nearest regrinding shop to their address.

This clearly showed that like every new field it must be developed and that regrinding is but just coming into its own. The machine shop, repair shop, or welding concern who starts now in some of the virgin localities that are still untouched are just in time to reap the benefits of this development.

This is particularly true of shops centralized in a trading center of repair work who are not getting all the potential possibilities. The fact that you have a Heald and are doing regrinding gives you a prestige and sign of quality. The results of reground cylinders are so satisfactory that the owner immediately becomes your best booster.

The Heald Machine Company has been in close touch with this field for years and have built especially for it a Style No. 55, simple to run and with a range that will handle any job that may be brought in. It comes fully equipped ready to go to work. Let us send complete data on regrinding and the Heald Machine.

Heald Machine Exhibited by the Walraven Co., Atlanta, Georgia.



The Heald Machine Co.

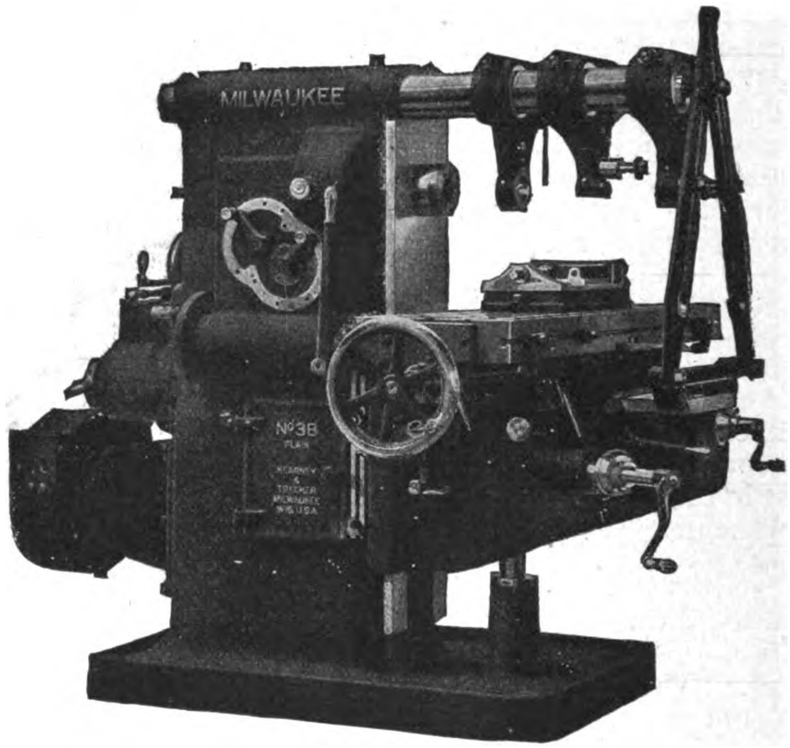
35 New Bond Street, Worcester, Mass.

Branches:

New York	839 Singer Bldg.
Philadelphia	1302 Stephen Girard Bldg.
Chicago	26 South Jefferson St.
Detroit	400 Marquette Bldg.
Cincinnati	311 Provident Bank Bldg.
Cleveland	721 Engineers Bldg.
Buffalo	331 Jewett Ave.

AGENTS: Eccles & Smith Co., San Francisco, Los Angeles, Portland and Seattle; Salt Lake Hardware Co., Salt Lake City; Hendrie & Bolthoff M'fg. & Supply Co., Denver; F. E. Satterlee Co., Minneapolis; The Oliver H. Van Horn Co., Inc., New Orleans, The Russell Hardware Co., McAlester, Okla., The Young and Vann Supply Co., Birmingham; G. Norman Baughman Co., Tampa; The Walraven Co., Atlanta; Greensboro Supply Co., Greensboro, N. C.; Geo. F. Foss Machinery Co., Montreal Can.; H. W. Petrie, Ltd., Toronto, Ont., Can.; Smith-Courtney Co., Richmond, Va.; Mills & Lupton Supply Co.; Chattanooga, Tenn.; Krueger Machinery Co., San Antonio.

MILWAUKEE MILLING MACHINES

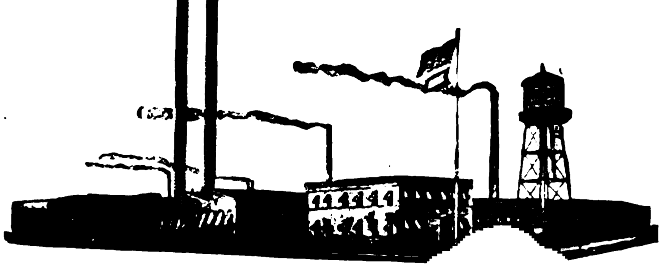


PROFITABLE PRODUCTION CAPABILITIES

Milwaukee Milling Machines are rigid, rapid, accurate and capable. This statement is not one that has sprung up from our own opinion; instead it has developed from many years of hard, constant usage of these machines in many plants of high repute all over the world.

Milwaukee Milling Machines are not cheap, nor are they expensive when you compare them with what they are capable of doing. Their many features of design and construction enable them to produce profitably over a long period with minimum upkeep and supervision.

Write for literature—NOW.



KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WIS., U.S.A.

CHICAGO OFFICE 631 WASHINGTON BLVD. · CLEVELAND OFFICE 738 SUPERIOR AVE. N.W · NEW YORK OFFICE 50 CHURCH STREET

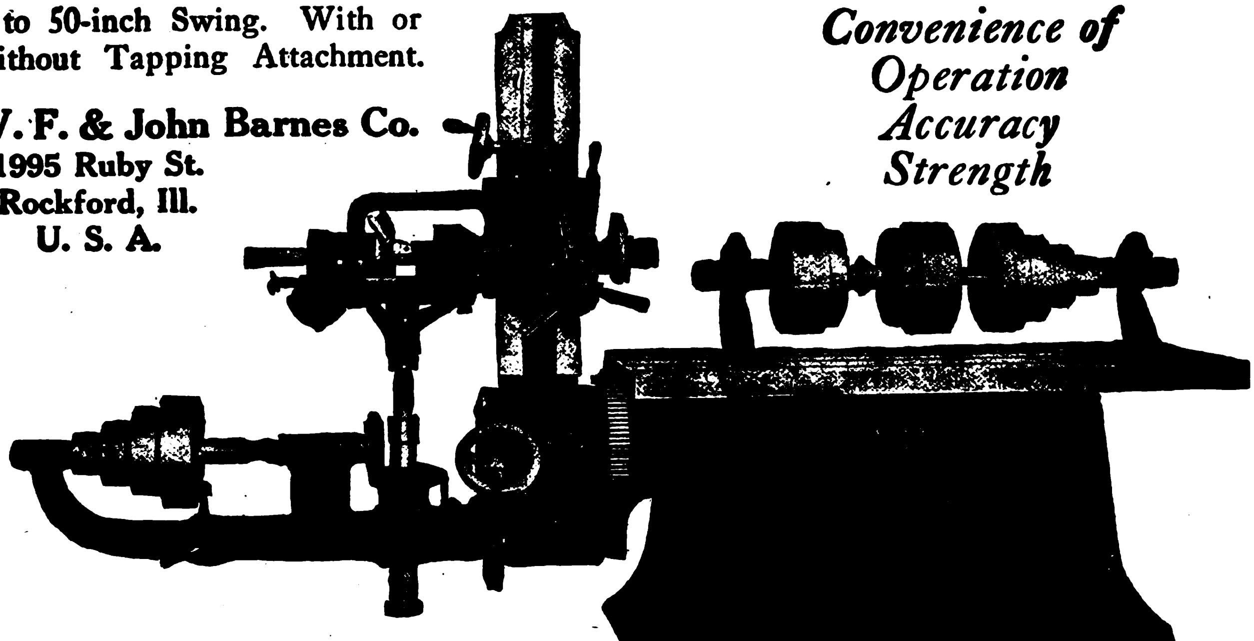
BARNES DRILLS

UPRIGHT—HORIZONTAL—GANG

8 to 50-inch Swing. With or without Tapping Attachment.

W. F. & John Barnes Co.
1995 Ruby St.
Rockford, Ill.
U. S. A.

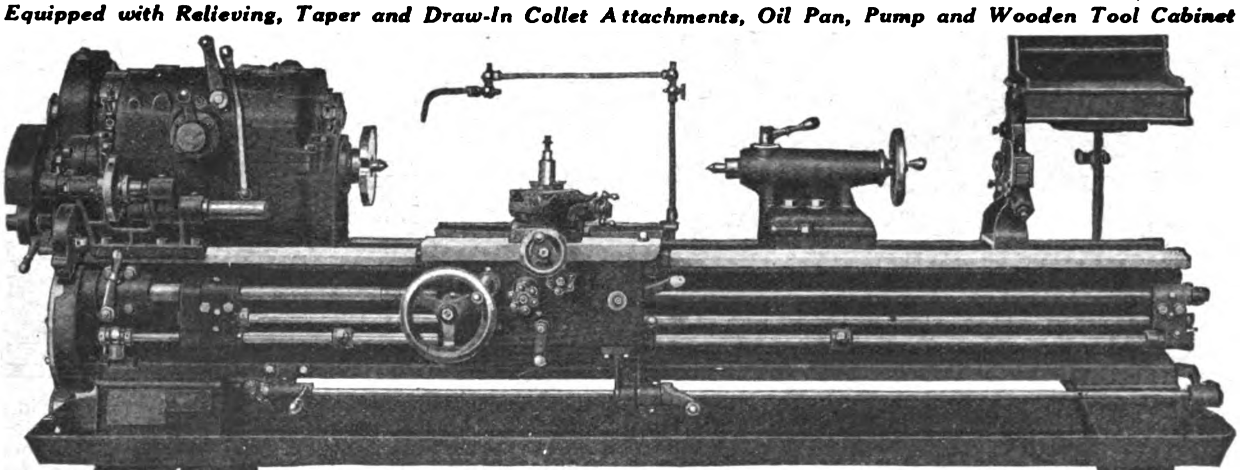
Convenience of Operation Accuracy Strength



SPRINGFIELD

IDEAL GEARED HEAD ENGINE LATHE

Equipped with Relieving, Taper and Draw-In Collet Attachments, Oil Pan, Pump and Wooden Tool Cabinet



This lathe meets every modern demand for high power, wide range of correct speeds, high efficiency and long life. Thrust bearings and all journals (except on main spindle) are ball bearings. Power transmitted with least number of gears, and all speeds directly obtained. Operating levers handy, and, being short, prevent rough handling of gearing. *Send for Circular No. 139.*

Our famous Friction Head feature can be furnished with this machine on request

The Springfield Machine Tool Co., Springfield, Ohio, U.S.A.

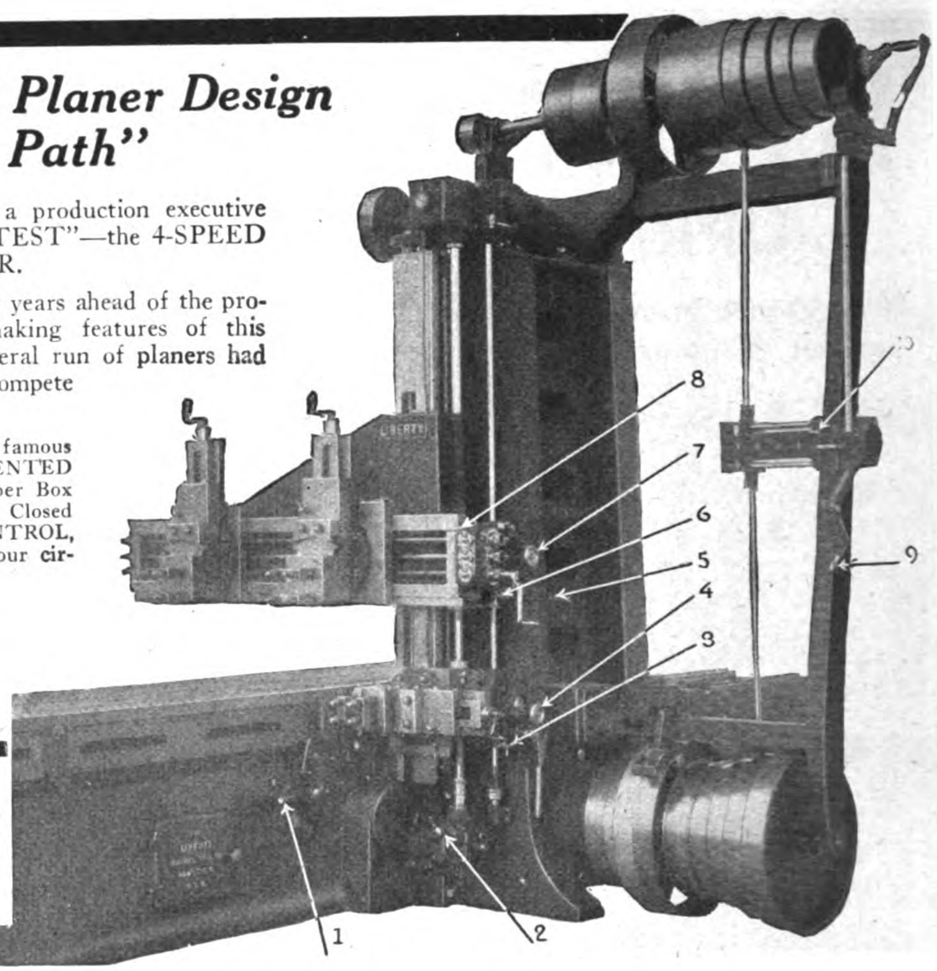
AGENTS: Manning, Maxwell & Moore, Inc., New York, Boston, Philadelphia, Buffalo, Syracuse, New Haven, Pittsburgh, St. Louis, San Francisco, Seattle, Cincinnati; The E. L. Essley Machinery Co., Chicago, Ill.; The Riverside Machinery Depot, Detroit, Mich.; The Cleveland Duplex Machinery Co., Cleveland, Ohio.

"You Have Lifted Planer Design Out of the Beaten Path"

That was the candid comment of a production executive who watched the work of our "LATEST"—the 4-SPEED OPENSIDE QUALITY PLANER.

LIBERTY Engineers, always a few years ahead of the procession, had perfected the epoch-making features of this NEW machine even before the general run of planers had been modified here and there to compete with the original LIBERTY.

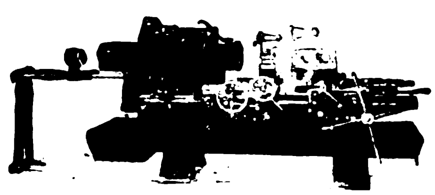
Today there is no real substitute for the famous LIBERTY PATENTED FEED, PATENTED 4-Speed Belt Drive, PATENTED Clapper Box Clamp, Tool Box in Bed, Top of Bed Closed Between V's, CENTRALIZED CONTROL, and many other features described in our circular.



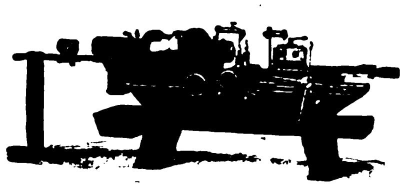
Liberty Machine Tool Company
Hamilton, Ohio

Most of all—remember that there is no substitute for LIBERTY workmanship and LIBERTY Service.

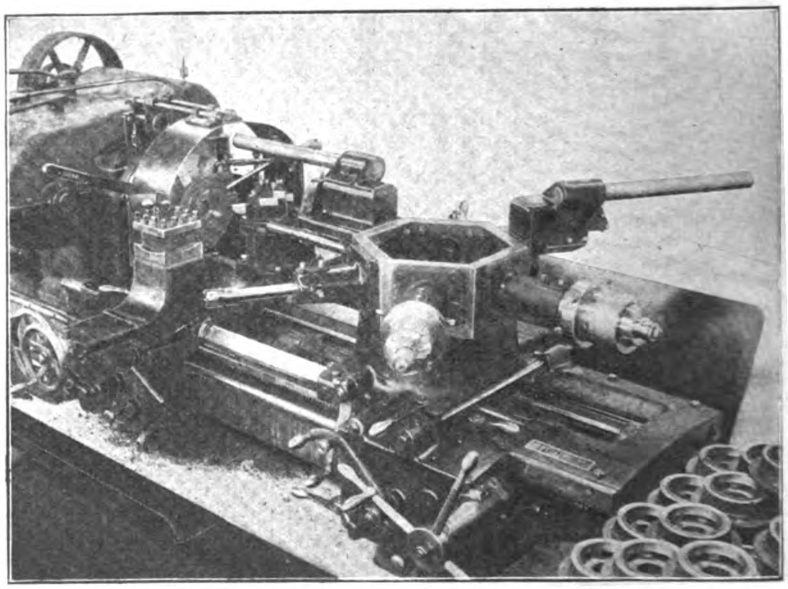
Send for the circular today.



Universal Turret Lathes, 3 Sizes



Screw Machines, 5 Sizes



Cutting the Cost

The production manager says—"Greater production and cheaper tool maintenance is what we want. Our present method is doing them in from seven to ten minutes each, and requires three machines to meet our demands. Can you better that?" (He was talking about differential housings, at one of the world's largest auto corporations plants.)

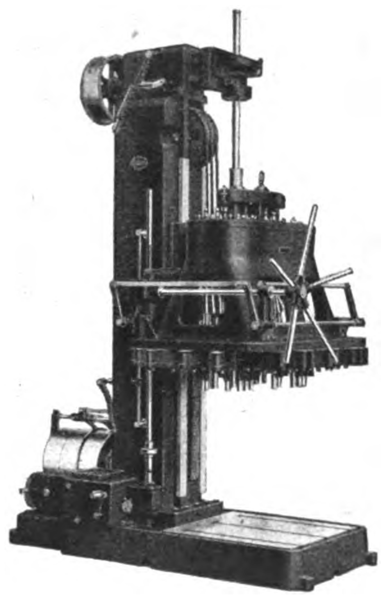
We guaranteed to do them in 3½ minutes, and the special tooled No. 3-B Universal Turret Lathe more than met expectations. *The average time is 2½ minutes.* One No. 3-B Universal Turret Lathe is now doing the work formerly done on three. Some saving. Six seconds for chucking in the W. A. Barker Wrenchless Chuck is an important factor in time saving on this job too. The work is removed while slowly coming to a stand still. All in all it is only characteristic of the Foster way of doing things.

How much can we save for you? It is well worth investigation.

FOSTER MACHINE CO., Elkhart, Indiana

MULTI-DRILLERS NATCO MULTI-TAPPERS

THE HOLE STORY IN ONE WORD



Reduces Costs

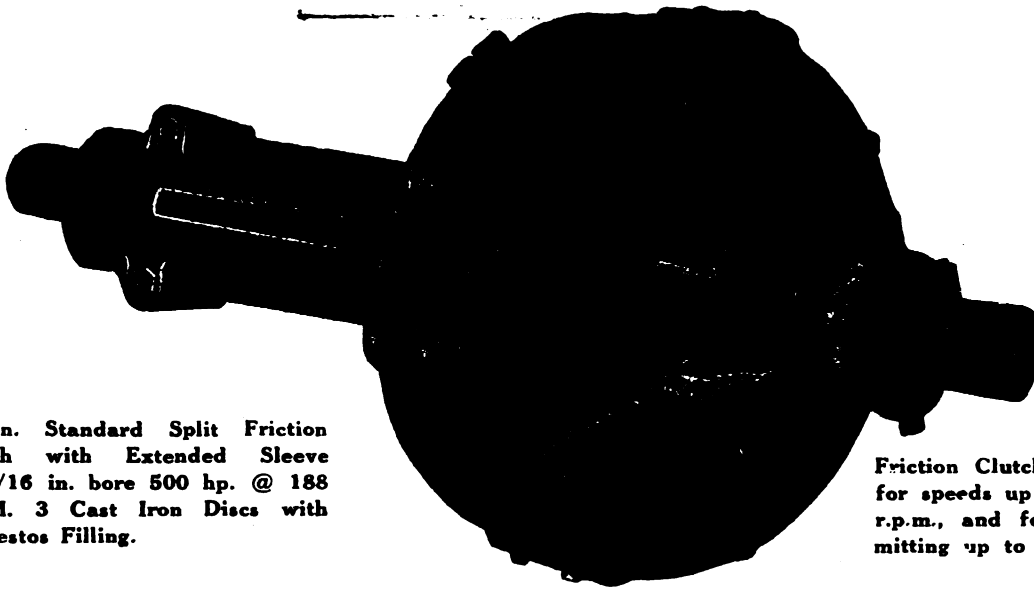
Increases Production

The No. 30

NATCO

The National Automatic Tool Company

Richmond, Indiana, U. S. A.



32 in. Standard Split Friction Clutch with Extended Sleeve 5 15/16 in. bore 500 hp. @ 188 R.P.M. 3 Cast Iron Discs with Raybestos Filling.

Friction Clutches built for speeds up to 3000 r.p.m., and for transmitting up to 630 h.p.

Power Savers for Your Plant

Substantial, durable, metal-to-metal clutches, operating at speeds allowing them to be used directly on A. C. motor shafts and for high speed line and group drives.

MOORE & WHITE HIGH SPEED CLUTCHES

They enable more efficient A. C. motors to be used, because the motors do not have to start under load.

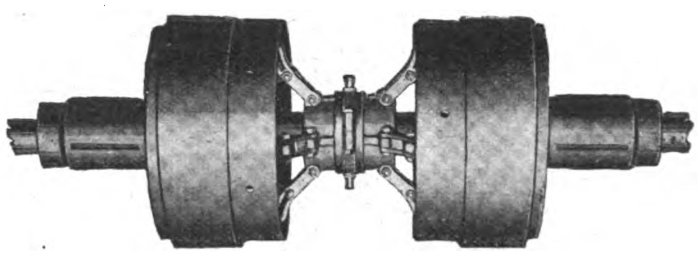
They make big pulleys and heavy belting unnecessary. They make it easy to cut out idle lines.

Bronze to cast-iron discs, dustproof and oil tight. Finely balanced and easy to adjust. Take hold smoothly and do not drag. Not to be confused with ordinary wood-block clutches for ordinary service.

Sold by all leading mill supply houses.

Figure your clutch installations with these books
Sent free upon request

Ask for Catalogs "D"

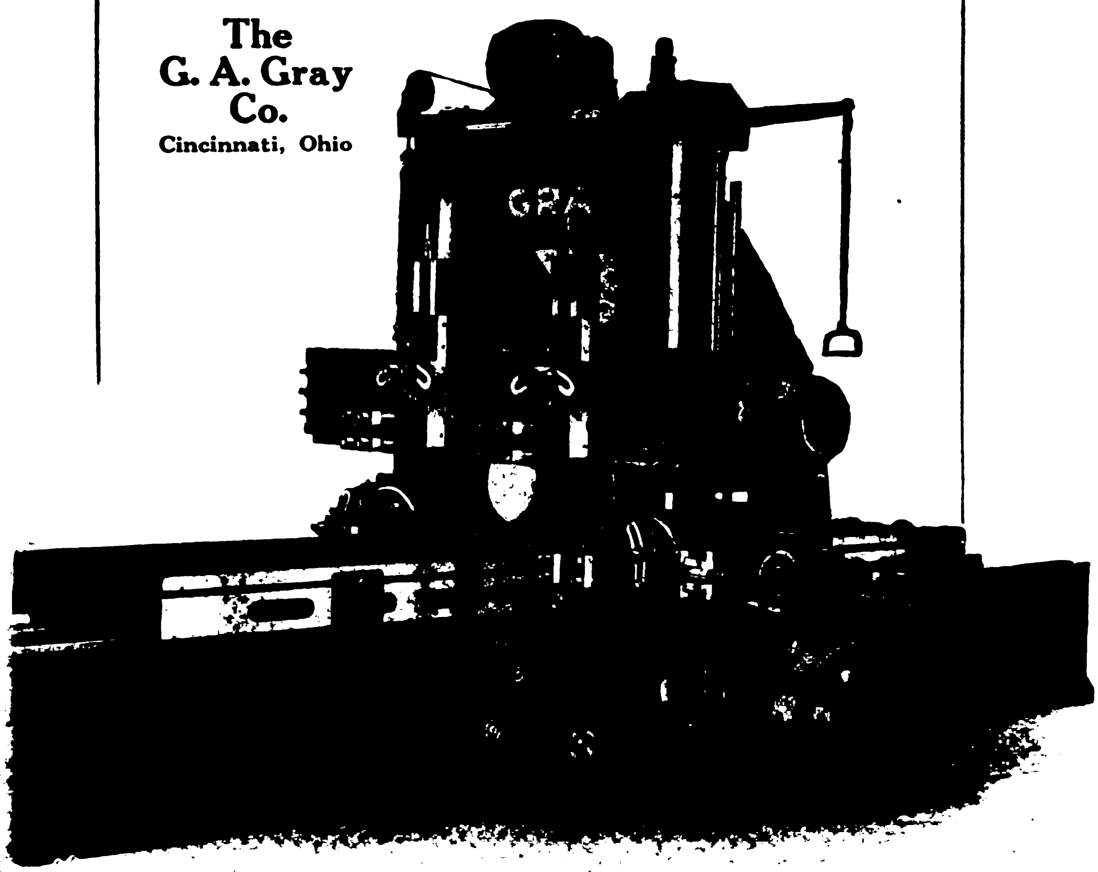


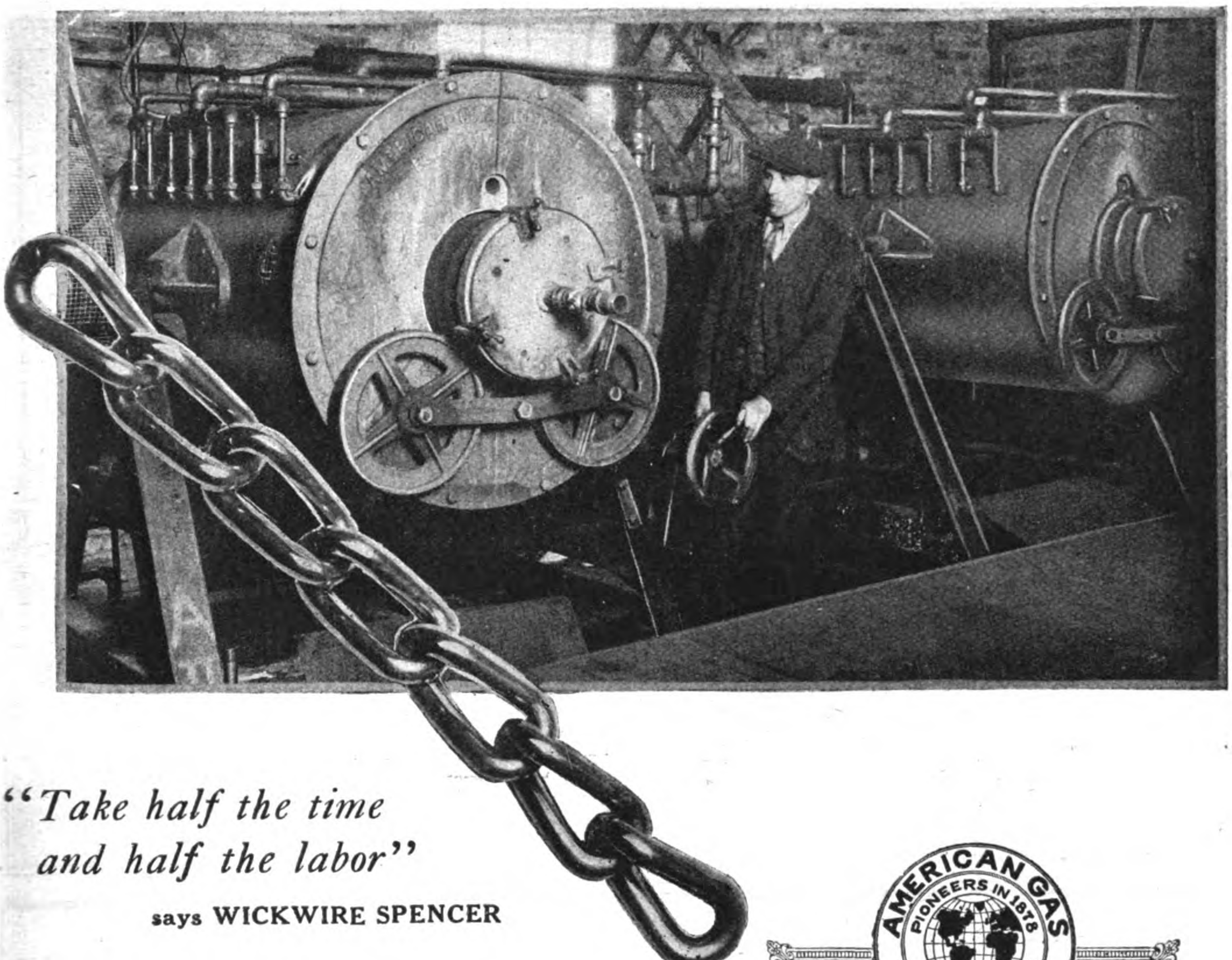
17 in. High Speed Duplex Friction Clutches with Extended Sleeves
3 Bronze Discs—150 H.P. at 600 R.P.M.

THE MOORE AND WHITE COMPANY

36 Years' Experience Building Friction Clutches

2709-2739 North 15th St., PHILADELPHIA, U. S. A.


GRA



"Take half the time and half the labor"

says WICKWIRE SPENCER

If you wanted to compare the merits of various heat-treating methods, fuels, and equipment, you couldn't ask for better conditions than prevail in the Buffalo plant of the Wickwire Spencer Steel Corporation. This organization, famous for its steel products of all kinds, has had long and successful experience in the hardening, carbonizing and annealing of metal under varying conditions.

The two

AMERICAN
Gas Carbonizing Machines

above are entrusted especially with the heat-treating of chain of all sizes. In comparing its work with all other methods previously used, this firm advises that it not only consumes half the time and half the labor of the old methods but "produces a more uniform product—perfect heat control. More compact, with less maintenance cost."

Whether your problem is the heat-treating and carbonizing of tiniest screws (6000 to the lb.) or large machine parts up to ½ ton, our equipment, backed by 44 years' experience, can save you money.

Let us estimate on your heat-treating problem—write today.

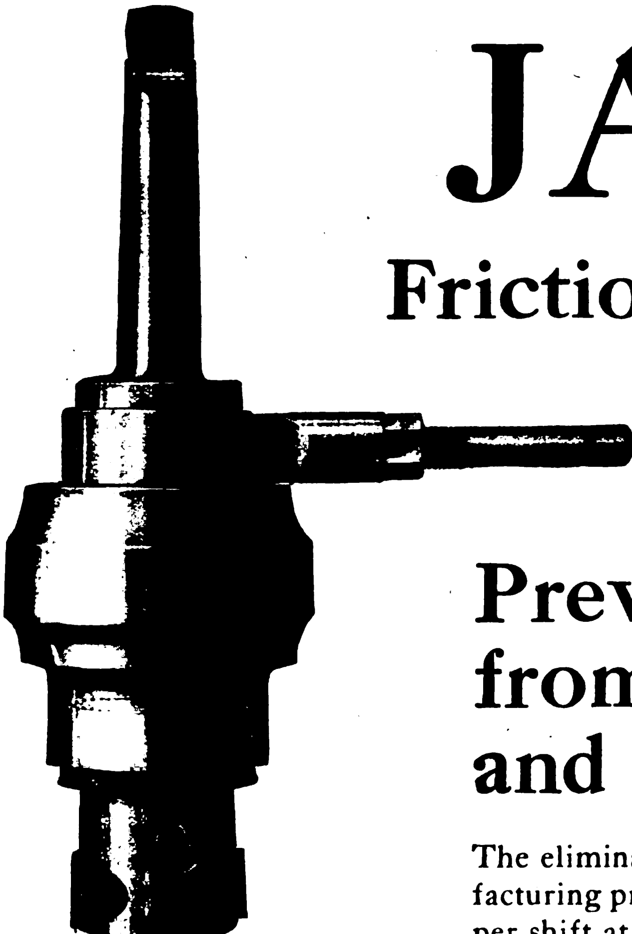
AMERICAN GAS FURNACE CO.

Main Office and Works: Elizabeth, N. J.

AMERICAN GAS FURNACE CO.
PIONEERS IN 1878
LEADERS TO-DAY

American Gas Furnace Products Include:

Automatic Quenching Tanks
Blowers
Blowpipes or Blowtorches, Hand and Stand
Boosters, Gas
Brass Melters
Brazing Furnaces and Tables
Burners
Burners for Electric Lamp Bulb Manufacture
Carbonizing Machines
Cyanide Furnaces
Cylindrical Furnaces
Forges
Forges, Glass Bending
Hardening Hammers
Heating Machines
Melting Furnaces
Muffle Furnaces
Oil Tempering Furnaces
Oven Furnaces
Plating Furnaces
Rivet Heaters
Soft Metal and Lead Hardening Furnaces
Soldering Iron Heaters
Sweep Reducing Furnaces
Tempering Plates
Tire Heaters
Tube Heating Furnaces
Every Type of Gas Blast Burner, Furnace and Heating Machine for Industrial uses.



JARVIS

Friction Tapping Device

Note the size and location of the Cone Friction Drive in the *Jarvis Friction Drive Tapping Device.*

Prevents Waste from Tap Breakage and Spoiled Parts

The elimination of waste is vital to present-day manufacturing processes. Competition demands more pieces per shift at less cost per piece.

The **Jarvis Friction Drive Tapping Device** prevents stripped threads and broken taps on light tapping. The **Cone Friction Drive** relieves all strain in driving the tool. The pressure comes on the machine spindle that drives the device.

Holes are tapped in the toughest metal without danger of tap fracture and stripped threads are entirely eliminated. The tapping range is from 0 to 1/4 inch.

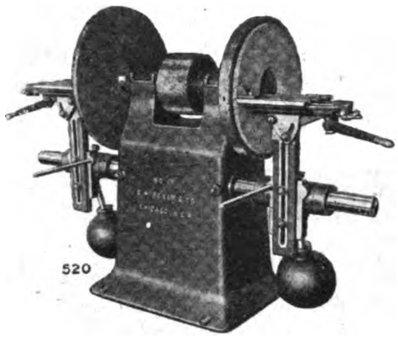
Here is a Tool that very thoroughly reduces Production Cost.

Any standard Jarvis product will be sent on trial to reliable concerns.

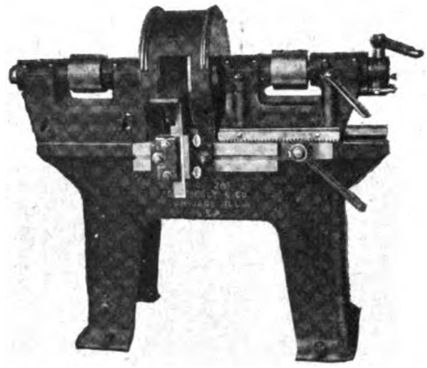
Jarvis High-Speed Tapping Devices and Quick-Change Chucks and Collets are carried solely by The Geometric Tool Company.

Cone Friction Drive

The Geometric Tool Co., New Haven, Conn., U. S. A.
Chicago Office, 627 Washington Blvd.



It is not uncommon for a Single Spindle Besly Grinder to reduce milling or planing costs 50 to 90 per cent and to produce 2 to 20 times the amount of output obtained from more expensive machine tools of other types.



For grinding two opposed parallel surfaces simultaneously, the Double Spindle Besly Grinder is widely used on piston rings, carbon blocks, pliers, cap screws, wrenches, etc.

FOR ECONOMICAL PRODUCTION

buy from

BESLY
CHICAGO

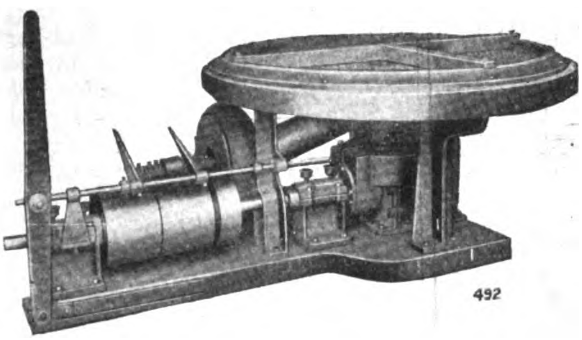
Charles H. Besly & Company

128 North Clinton Street, Chicago, U. S. A.

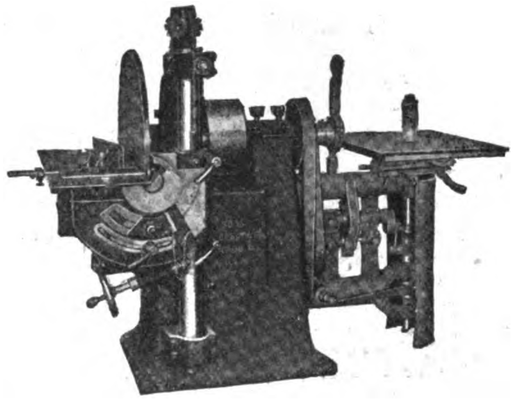
Originators of Disc Grinders

Exclusive patented features found only in the Besly are Geared Lever Feed Table and Automatic Ring Oiling Lubrication. Besly Grinders are Ring Oiling Machines with inserted renewable phosphor bronze bearing bushings; and though we have been marketing this class of equipment for eight years none of the bushings have so far needed renewing.

Ask for our latest catalog.

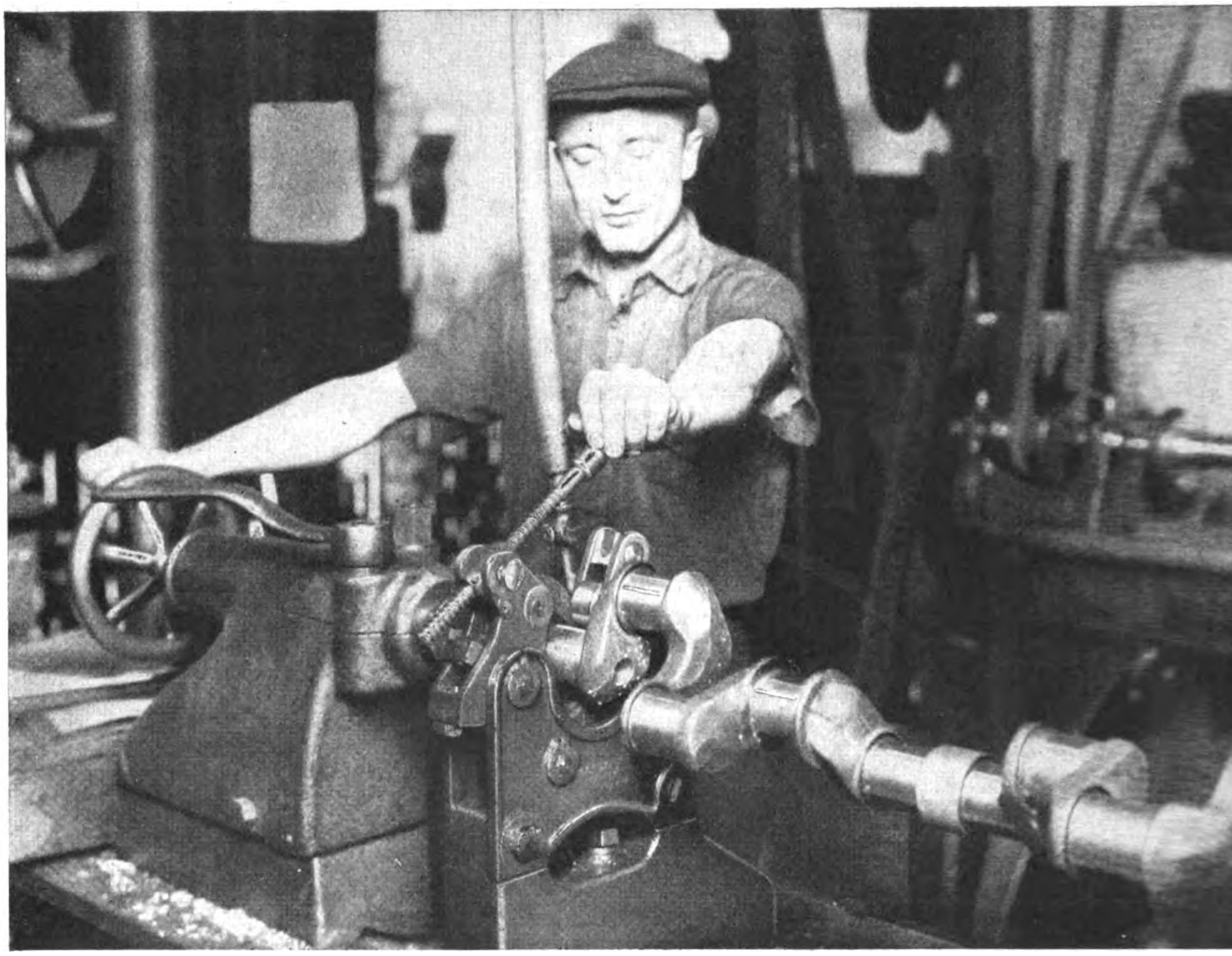


A Vertical Spindle Besly Grinder. The work is placed *on* the disc wheel—not chucked—Ideal for surfacing foundry flasks, stove and furnace doors, gear and meter cases, split bearings and work of like character.



An invaluable Pattern Department tool, eliminating the slow costly handwork of highly paid skilled patternmakers—The Besly Patternmaker's Grinder does the work quicker, cheaper, better.

Cut Production Costs McCrosky COST-CUTTING TOOLS ***Cut Production Costs***



Spoilage Cut to Zero—Time in Half

McCROSKY STEADYRESTS

Are delivering that service in the **Detroit Plant** of the **Studebaker Corporation.** On the job shown here, a McCrosky Steadyrest, mounted on an engine lathe, is recentering the clutch end of a crank shaft to be used in a "Studebaker-Six." Before the McCrosky Steadyrest was installed, approximately 40% of the cranks were thrown out by the Studebaker inspectors on account of being imperfectly centered. Since the Steadyrests have been introduced absolutely no cranks have been rejected. And the time of operation has been cut down one-half.

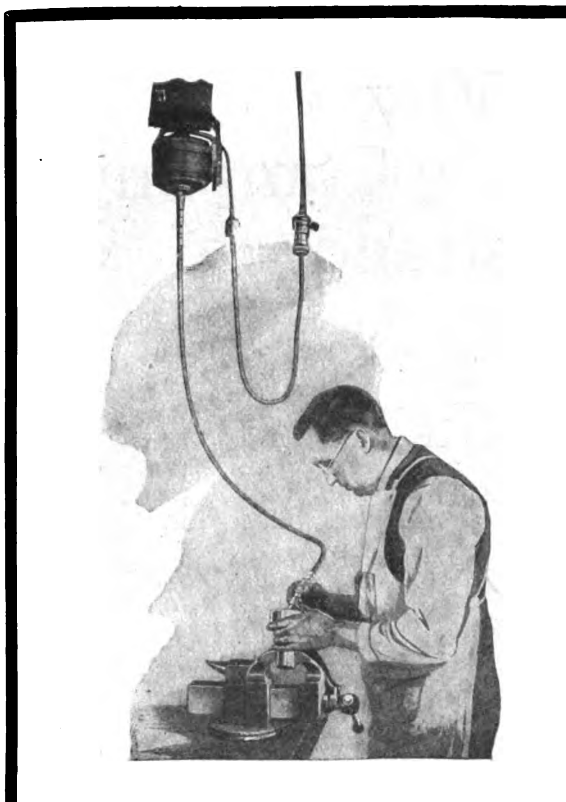
Before installing the McCrosky Steadyrest on actual production work the Studebaker Corporation tested it out by using a test plug 14 in. long. With that amount of overhang the hole was out of alignment only .0002 in. It is this ability to secure dead alignment that makes the McCrosky Steadyrest particularly effective in all operations to be performed on the end of a piece, such as facing, boring, turning, centering, etc.

It is self-centering, frictionless, and quick acting. It is equally valuable for a variety of general work and for production work in quantities. Once adjusted to the lathe centers, it remains always adjusted and enables the operator to go quickly from the smallest to the largest diameter of work without any adjustment. If you use engine lathes, you can use McCrosky Steadyrests to advantage.

Send for a McCrosky Steadyrest Bulletin Today

McCrosky Tool Corporation, Meadville, Pa., U.S.A.

Branches in Boston, New York, Detroit, Chicago, San Francisco
Agencies in all other principal cities
Export Agents: **Benjamin Whittaker, Inc., 21 State St., New York.**
Benjamin Whittaker, Ltd., 56 Ludgate Hill, London, E. C. 4.



HERGI GRINDERS

Any Place and Plug in on Your Lighting Circuit

Could anything be handier or more convenient?

It is the Hergi D S 4 Outfit for Die Sinking and Small Grinding—also adjustable for jewelry manufacturing, embossing and any metal working of a delicate nature.

Hand work on work of this nature is a slow, obsolete and expensive method. Hergi Equipment triples the productiveness of your help and increases the character of the workmanship.

Specifications:

MOTOR—Special design—¼ hp. Ball Bearing, fitted with end and plug. Base rotary type, permitting operation from vertical, horizontal or suspended position.
SHAFT—¼ in. x 3 ft. wire wound.
SHEATH—Special design whip cord construction with metal lining.
HAND PIECE—Ball Bearing type with geared chuck.
ACCESSORIES—Assortment of mandrels, grinding wheels, high speed burs and grinding points.

HERGI MFG. COMPANY
General Sales Office and Factory:
5th Street, Bridgeport, Conn.

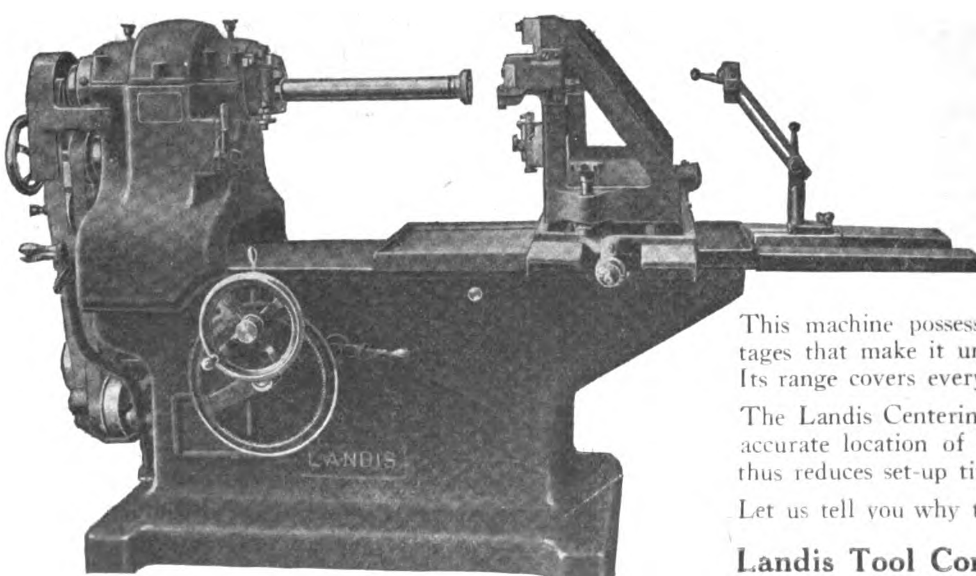
FOREIGN AGENTS: Goodchild & Partners, Ltd., London, England; Atlantic Baltic Co., Ltd., Copenhagen, Denmark.

Peak Profits With the Landis

There will be thousands of new automobiles, trucks and tractors purchased this spring, and every one of them represents a future business prospect for the repair shop man.

There are added thousands of vehicles, now registered, that will require repairs before starting on the new season's runs. These represent *immediate* prospects.

Are you going to go after some of this present business and gain a reputation that will assure your future? You can do so by installing a



LANDIS

No. 5 Cylinder Grinding Machine

This machine possesses a number of distinct advantages that make it unexcelled for cylinder regrinding. Its range covers every type of auto cylinder bloc.

The Landis Centering Fixture permits of speedy and accurate location of cylinder bores with spindle and thus reduces set-up time.

Let us tell you why the Landis is the choice.

Landis Tool Company, Waynesboro, Pa.
New York Office: 51 Chambers St.

DOMESTIC AGENTS—Hallidie Machinery Co Seattle; Harron, Rickard & McCone, San Francisco and Los Angeles; Southern Machinery Sales Co Houston; Seeger Machine Tool Co., Atlanta. CANADIAN AGENTS—F. F Barber Machinery Co Toronto; Williams & Wilson, Ltd Montreal; A R Williams Machinery Co Nova Scotia New Brunswick Manitoba and British Columbia. FOREIGN AGENTS—Allied Machinery Co Paris Turin, Barcelona, Brussels Zurich and Lisbon; Anderson Meyer & Co. Ltd Shanghai, Andrews & George Co. Ltd Tokyo. Benson Brothers Sydney and Melbourne Burton, Griffiths & Co., Ltd., London; Wilh. Sonesson & Co Malmo and Copenhagen.

Where a small attachment does the work of a big machine

This is an example of how the use of simple attachments on ACME MULTIPLE SPINDLE AUTOMATICS carry the work to a further degree of completion than is ordinarily expected in screw machine practice—and save the work of a "second operation" machine.

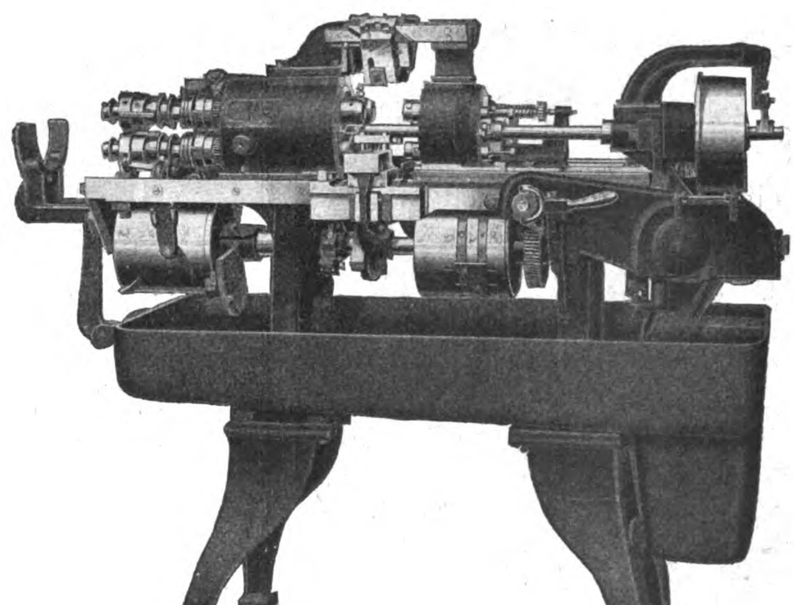
For work up to 2¼ in., convenient fixtures for milling, drilling, slotting from the side and end of the piece are accomplished without adding any time to "the longest operation."

These little attachments, which are standard and easily placed on any ACME of standard type, take the place of milling machines, drill presses, slotting machines, etc. They save not only the initial cost for special operations, but entirely eliminate floor space, extra machines, and added labor cost to operate them.

Find out more about ACMES and how they will lower your costs.

In Capacities:

¾ in.
1 in.
1⅝ in.
2¼ in.
3 in.
4 in.



THE NATIONAL ACME COMPANY
CLEVELAND, OHIO

New England Plant: Windsor, Vt. Canadian Screw Plant: Montreal, P. Q.

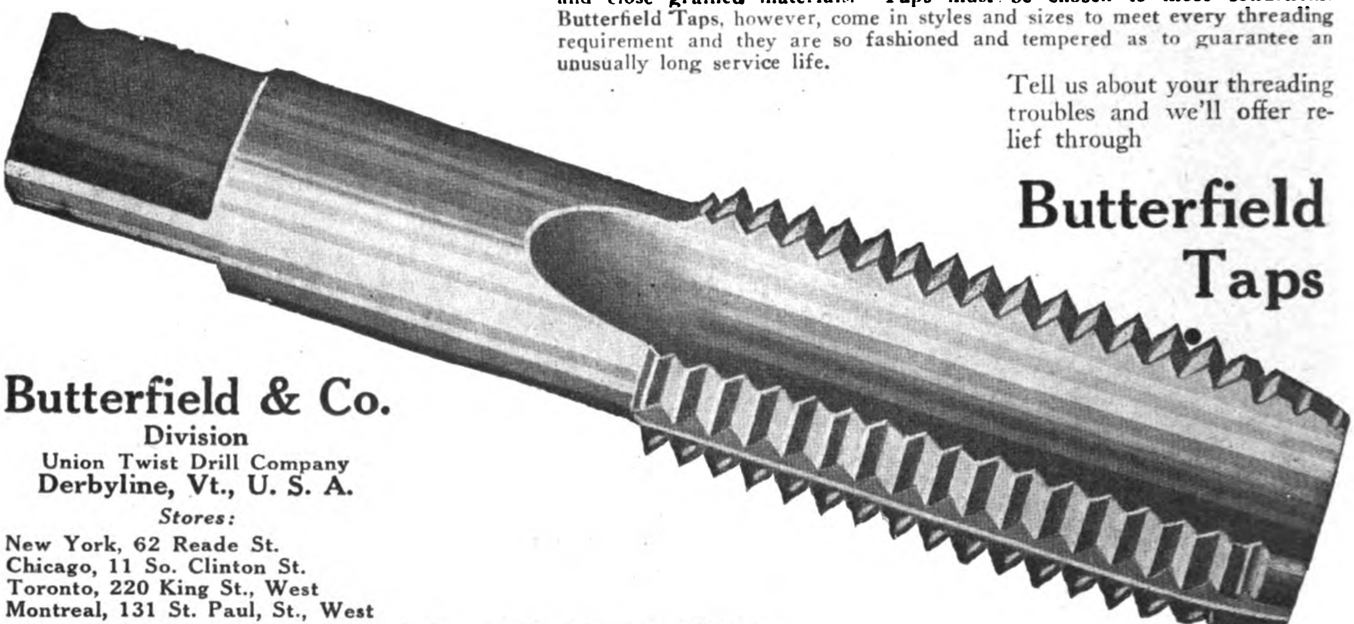
BRANCH OFFICES: NEW YORK BOSTON CHICAGO DETROIT BUFFALO

WAREHOUSES: NEW YORK and CHICAGO

Foreign Representatives: Great Britain, Chas. Churchill & Co., Limited. France, Belgium, Switzerland. Spain: for Gridleys, Potter & Johnston; for Acmes, Etablissements Horstmann. Sweden, E. Trobeck. Australia, Benson Brothers. Japan, Yamatake & Company. South Africa, D. Drury & Company.

For Meeting Varying Threading Conditions

No one design of tap will give equal satisfaction on soft and tough, stringy and close grained materials. Taps must be chosen to meet conditions. Butterfield Taps, however, come in styles and sizes to meet every threading requirement and they are so fashioned and tempered as to guarantee an unusually long service life.



Tell us about your threading troubles and we'll offer relief through

Butterfield Taps

Butterfield & Co.

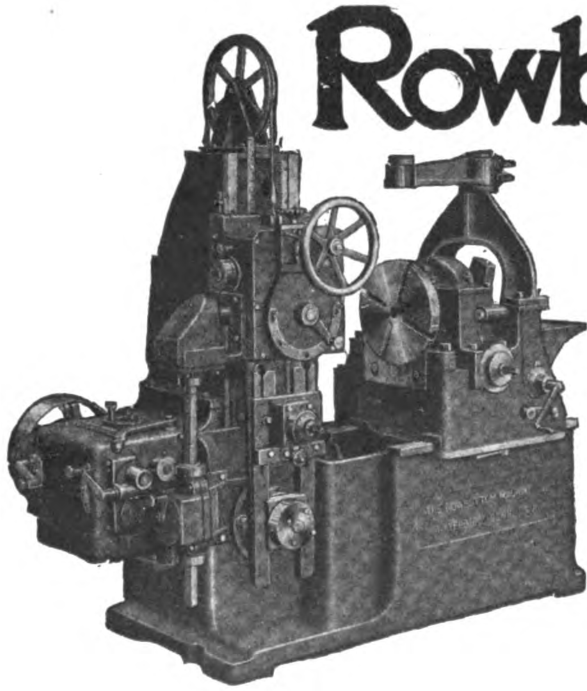
Division
Union Twist Drill Company
Derbyline, Vt., U. S. A.

Stores:

New York, 62 Reade St.
Chicago, 11 So. Clinton St.
Toronto, 220 King St., West
Montreal, 131 St. Paul, St., West

DOMESTIC REPRESENTATIVES: Pittsburgh, Somers, Fitler & Todd Co., 327 Water St.; Philadelphia, Diamond Specialty & Supply Co., 1225 Arch St.; St. Louis, Handlan-Buck Mfg. Co.; Cincinnati, J. R. Wood Supply Co., 917 Broadway; Buffalo, Syracuse Supply Co., 62 Pearl St.; Indianapolis, Vonnegut Machinery Co., 19 West South St. FOREIGN REPRESENTATIVES: Great Britain, Geo. H. Alexander, 83-85 Coleshill St., Birmingham, England; France, Italy, Belgium and Switzerland, Fenwick Freres, 8 Rue de Rocroy, Paris; Sweden, Norway and Denmark, Ab. Sigfr. Anderson & Co., Malmo; Spain, Casmitjana Hermanos, Barcelona; Japan, Abe-Kobel & Co., Yokohama; Greece, Stephen C. Stephanson, 11 Lycourgan St., Athens; Netherlands, Wynmalen Hausman, Rotterdam; Australia; Fairbanks-Morse & Co., 9 Young St., Sydney; South America, Charles Dreyfuss, B. Milre, 785, Buenos Aires, R. A.

Rowbottom for Cams



KEEP the above slogan in mind and you'll materially add to the quality of your product.

The Rowbottom Cam Milling Machine is easily operated. The simplicity and accuracy of the operating principle insure perfect reproduction of the most intricate cams at a commercially possible cost.

A cutter is mounted on a head which operates vertically through a roller against the master cam; the head is always in compression with no chance for back lash or deviation. Mechanically perfect construction that cannot help but produce accurate results.

Made to cut Box Cams to 32 in. outside diameter, Face Cams to 28 in. and Barrel Cams to 24 in. with an 11 in. throw.

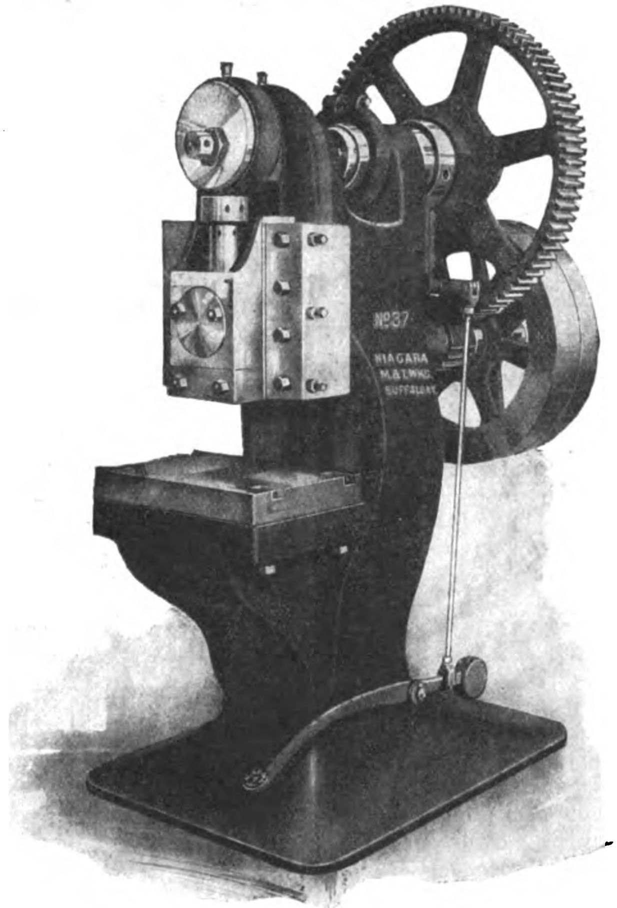
We also operate an efficient cam cutting department and will be pleased to estimate on your cam cutting needs.

The Rowbottom Machine Company

Waterbury, Conn., U. S. A.
Factory: Waterville, Conn.

Get the details of these machines

No. 37
Punch Press



Stock
Shipments

Niagara Power Punch Presses
Cut Your Costs

Are you satisfied that your present operating methods are the shortest and best obtainable?
Consult our experts, who will be pleased to give you their opinion without charge.
We manufacture a complete line of Presses, Punches, Squaring Shears, Ring and Circle Shears, Tinners' Tools and Machines, as well as equipments for special operations on Sheet Metal.

Write for a Catalog of the machines in which you are interested

Niagara Machine & Tool Works
Established 1879
Buffalo, N. Y.

NIAGARA

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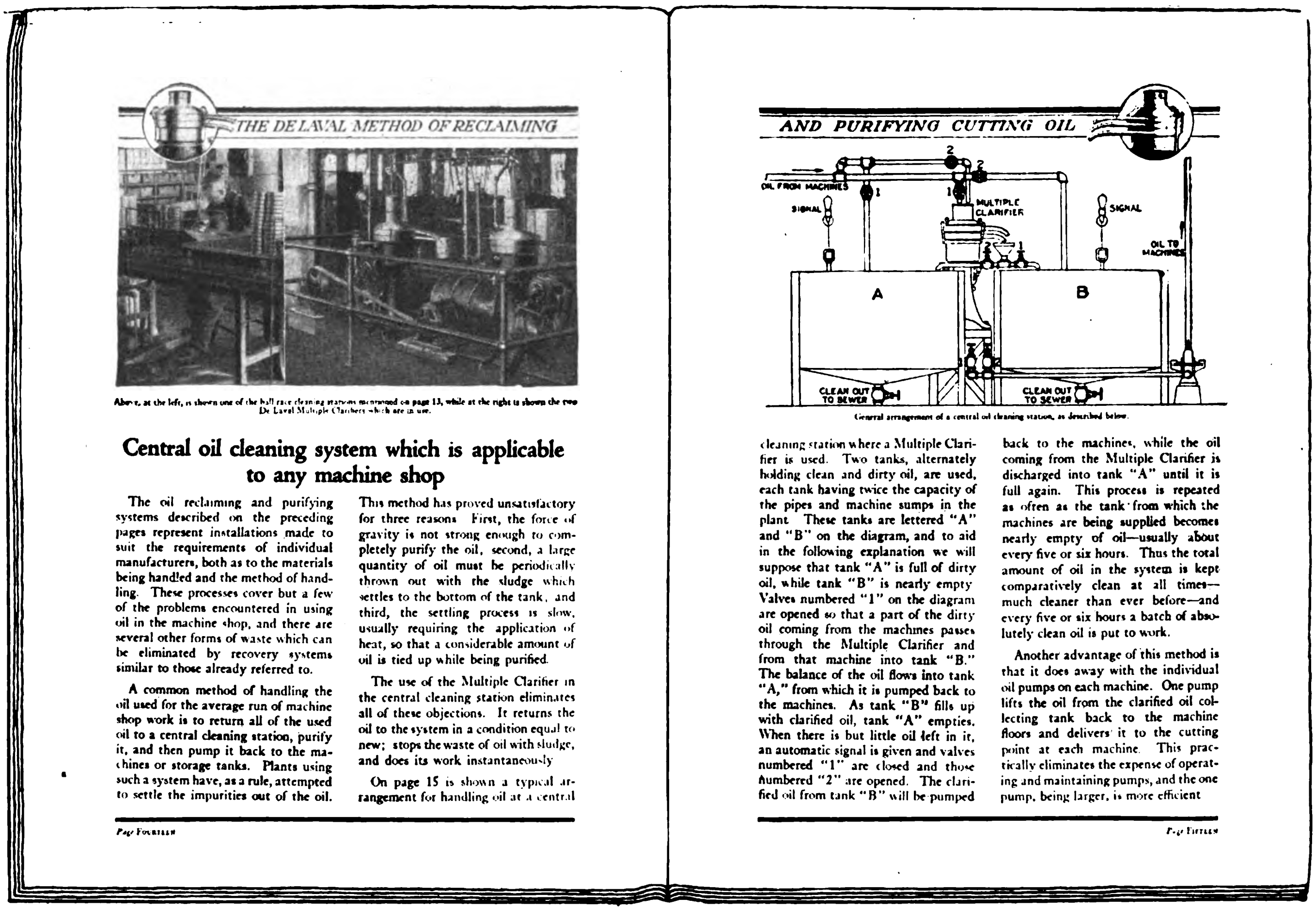

THE DE LAVAL METHOD OF RECLAIMING AND PURIFYING CUTTING OIL

Above, at the left, is shown one of the ball race cleaning stations mentioned on page 13, while at the right is shown the two De Laval Multiple Clarifiers which are in use.

Central oil cleaning system which is applicable to any machine shop

The oil reclaiming and purifying systems described on the preceding pages represent installations made to suit the requirements of individual manufacturers, both as to the materials being handled and the method of handling. These processes cover but a few of the problems encountered in using oil in the machine shop, and there are several other forms of waste which can be eliminated by recovery systems similar to those already referred to.

A common method of handling the oil used for the average run of machine shop work is to return all of the used oil to a central cleaning station, purify it, and then pump it back to the machines or storage tanks. Plants using such a system have, as a rule, attempted to settle the impurities out of the oil. This method has proved unsatisfactory for three reasons First, the force of gravity is not strong enough to completely purify the oil, second, a large quantity of oil must be periodically thrown out with the sludge which settles to the bottom of the tank, and third, the settling process is slow, usually requiring the application of heat, so that a considerable amount of oil is tied up while being purified.

The use of the Multiple Clarifier in the central cleaning station eliminates all of these objections. It returns the oil to the system in a condition equal to new; stops the waste of oil with sludge, and does its work instantaneously

On page 15 is shown a typical arrangement for handling oil at a central

Page Fourteen

General arrangement of a central oil cleaning station, as described below.

cleaning station where a Multiple Clarifier is used. Two tanks, alternately holding clean and dirty oil, are used, each tank having twice the capacity of the pipes and machine sumps in the plant These tanks are lettered "A" and "B" on the diagram, and to aid in the following explanation we will suppose that tank "A" is full of dirty oil, while tank "B" is nearly empty Valves numbered "1" on the diagram are opened so that a part of the dirty oil coming from the machines passes through the Multiple Clarifier and from that machine into tank "B." The balance of the oil flows into tank "A," from which it is pumped back to the machines. As tank "B" fills up with clarified oil, tank "A" empties. When there is but little oil left in it, an automatic signal is given and valves numbered "1" are closed and those numbered "2" are opened. The clarified oil from tank "B" will be pumped back to the machines, while the oil coming from the Multiple Clarifier is discharged into tank "A" until it is full again. This process is repeated as often as the tank from which the machines are being supplied becomes nearly empty of oil—usually about every five or six hours. Thus the total amount of oil in the system is kept comparatively clean at all times—much cleaner than ever before—and every five or six hours a batch of absolutely clean oil is put to work.

Another advantage of this method is that it does away with the individual oil pumps on each machine. One pump lifts the oil from the clarified oil collecting tank back to the machine floors and delivers it to the cutting point at each machine This practically eliminates the expense of operating and maintaining pumps, and the one pump, being larger, is more efficient

Page Fifteen

This book tells how to save cutting oil

A new 36-page De Laval Cutting Oil Bulletin is just off the press. It tells how many manufacturers are recovering more oil from chips and economically purifying the reclaimed oil so that its original efficiency is restored.

It shows how De Laval equipment is being used to separate oil from soda wash and put both products back into service. In short, it shows how all of the common forms of waste and annoyance in handling machine shop oils can be eliminated or materially reduced.

Printed in large type with plenty of illustrations, you will find this new De Laval Bulletin both pleasant and profitable to read. Just mail the coupon.

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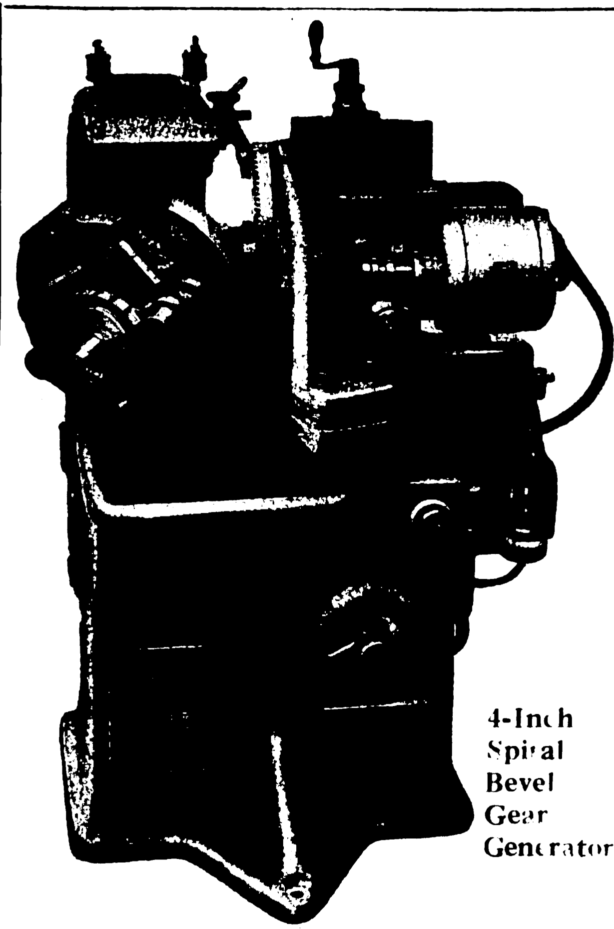

4-Inch Spiral Bevel Gear Generator

This machine has made it possible to obtain the well-known advantages of spiral gear drives in machines requiring very small gears, such as sewing machines, motion picture machines, etc.

When produced in quantities the cost of these small spiral gears is less than the cost of straight type.

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Every grain gets a real chance to cut because it has a definite clearance. The wheel doesn't fill and requires but little dressing.

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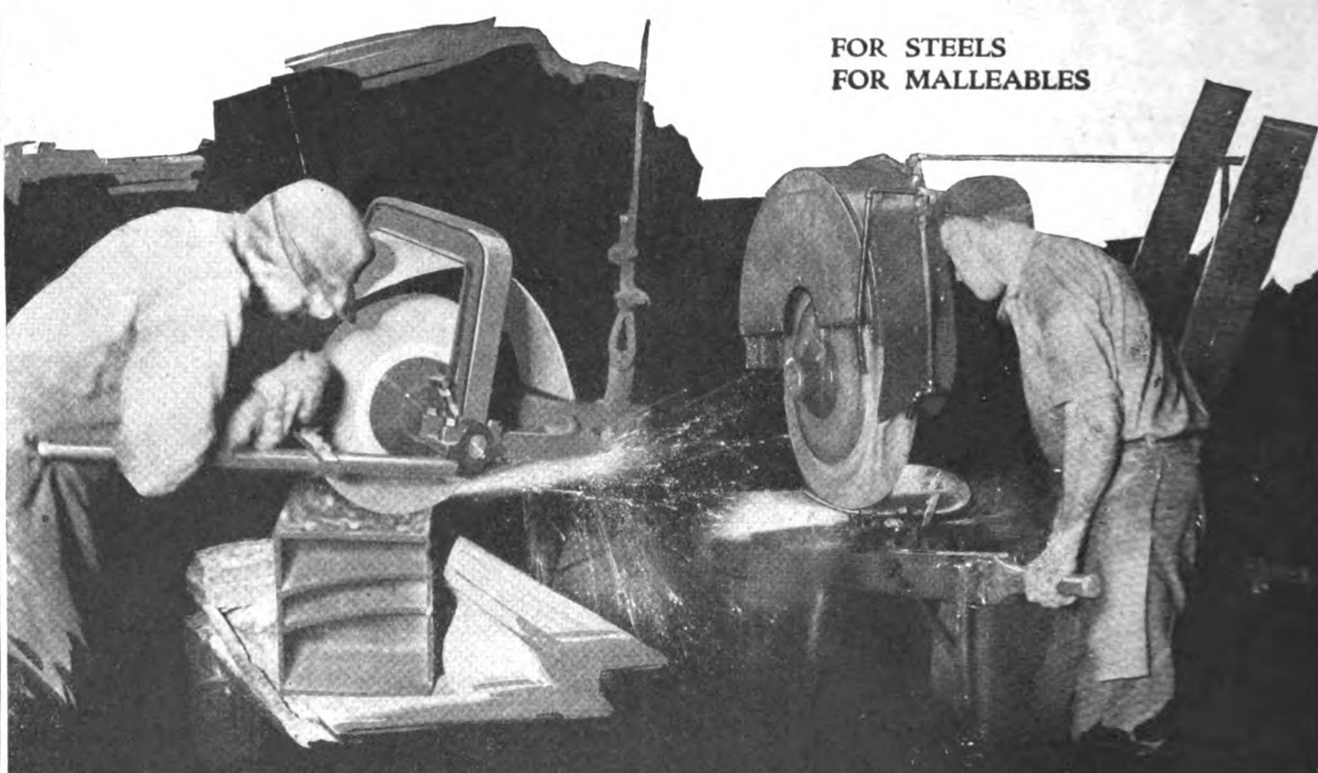

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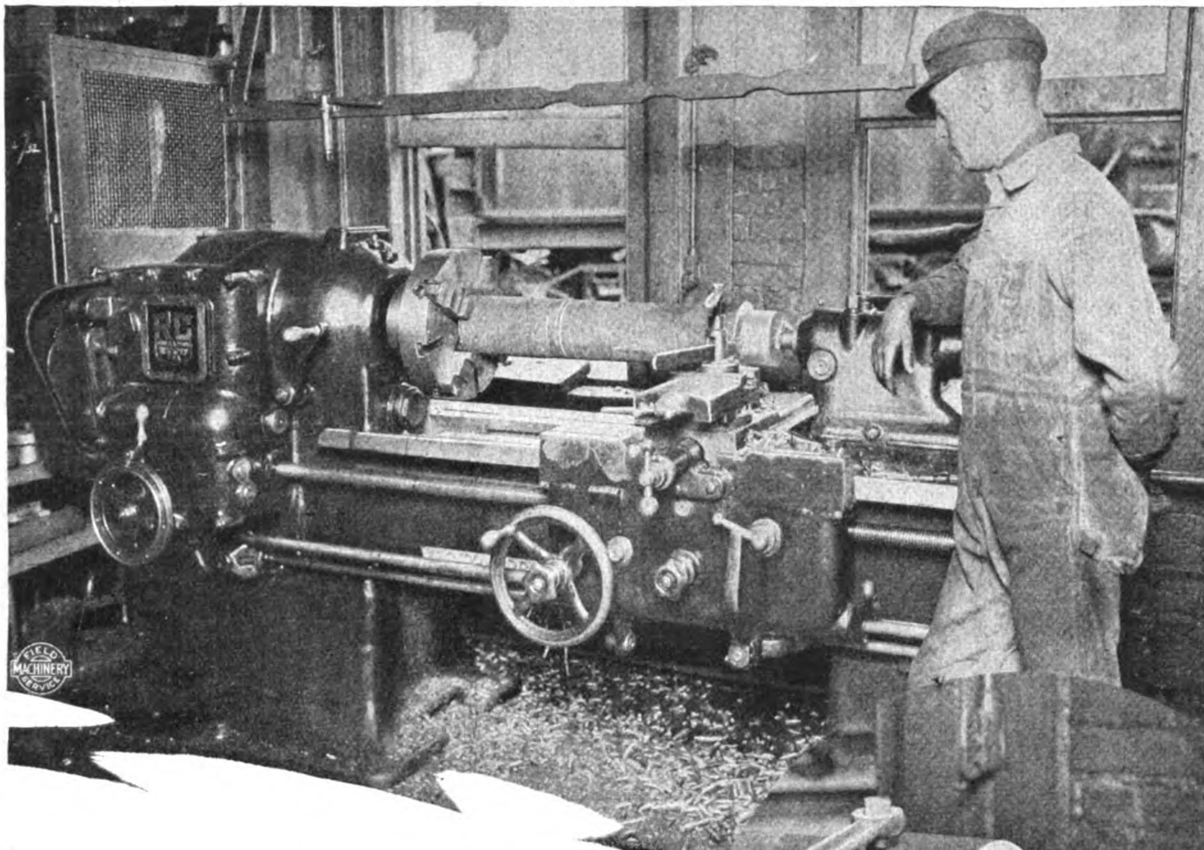

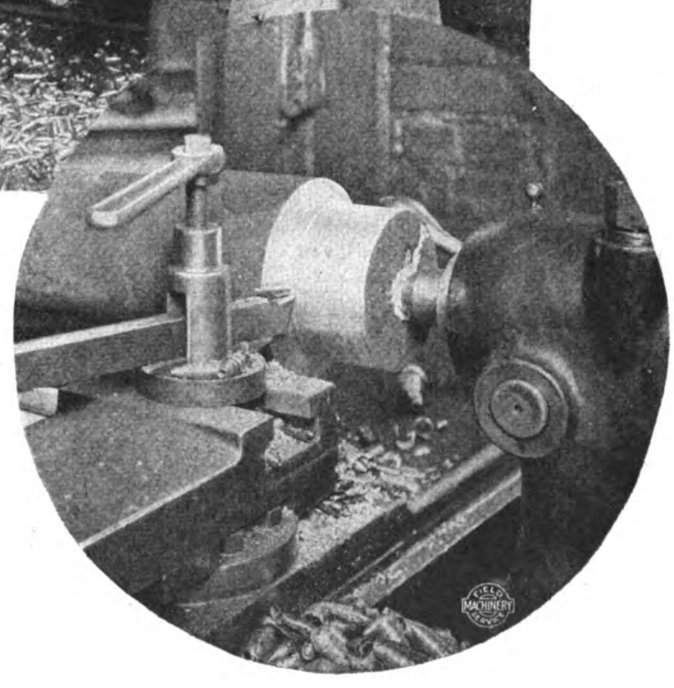

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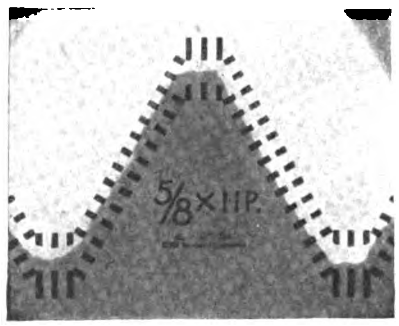

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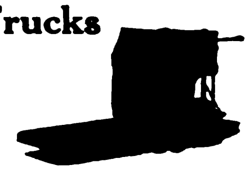

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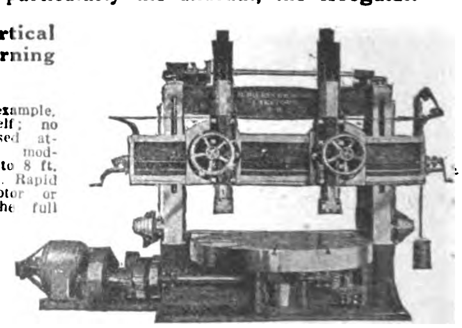

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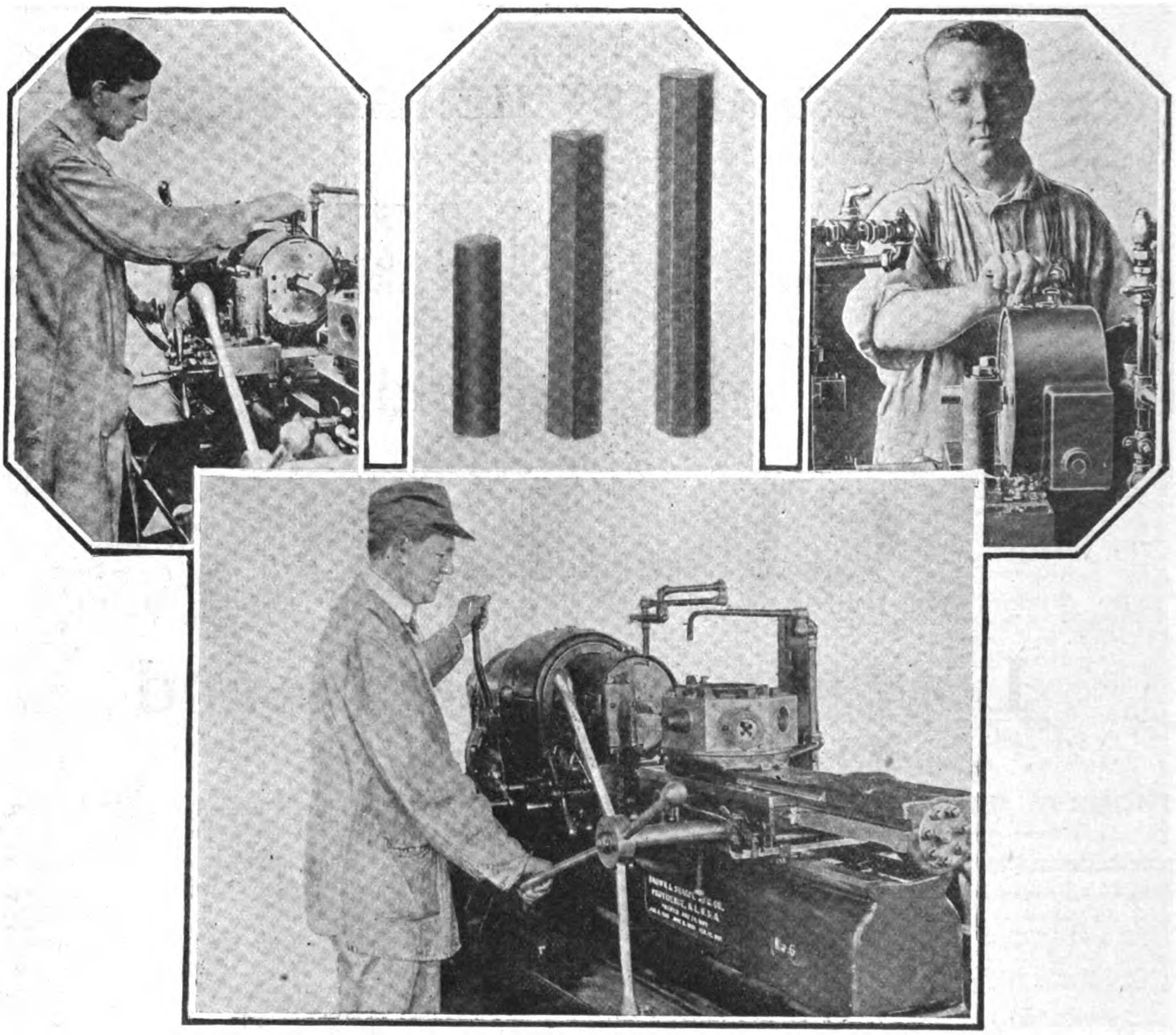

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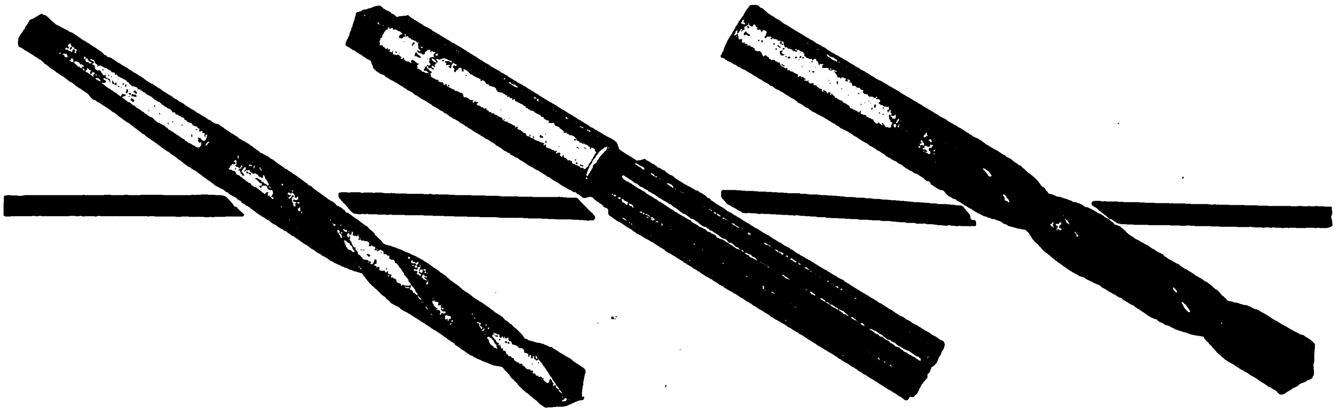

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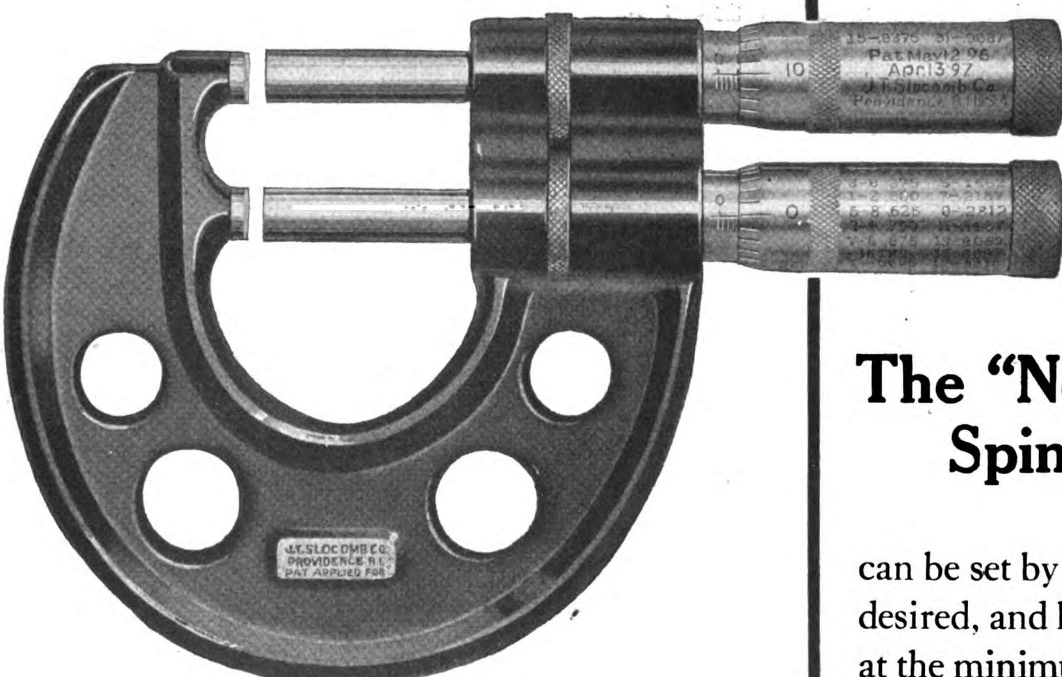

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can be set by standard if desired, and kept locked at the minimum limit.

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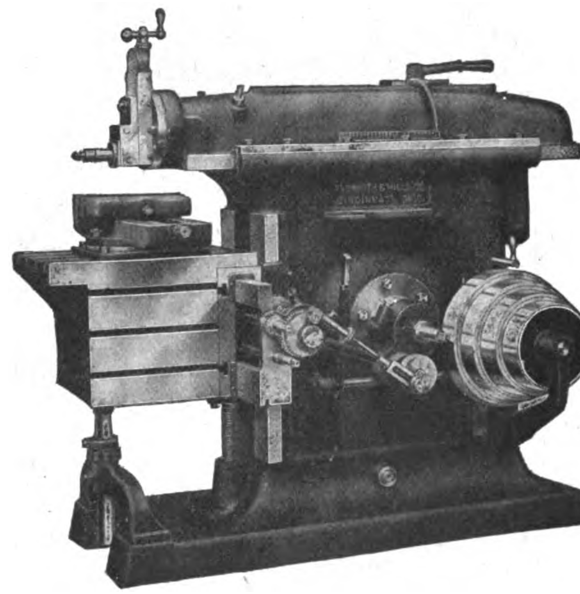

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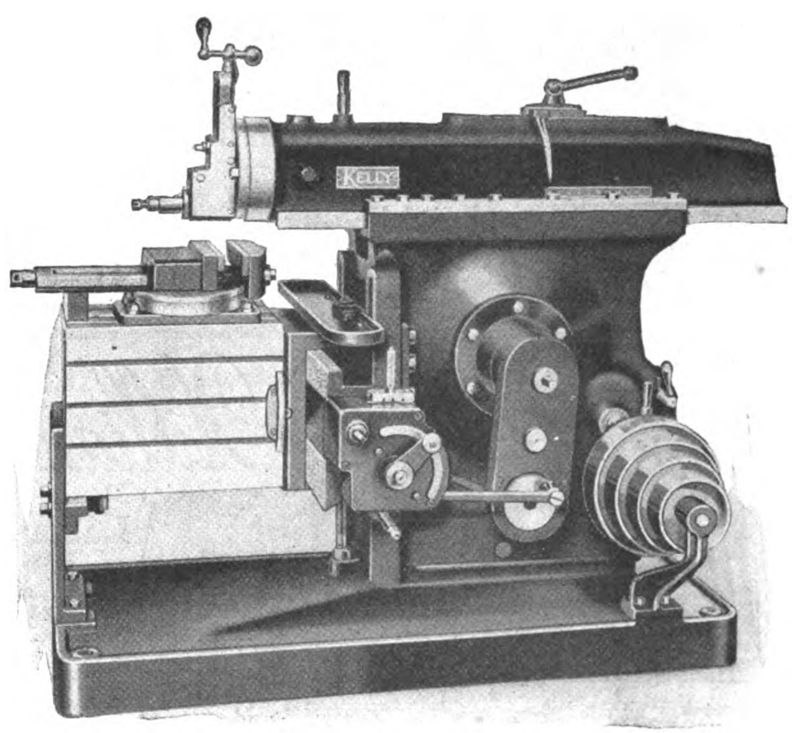

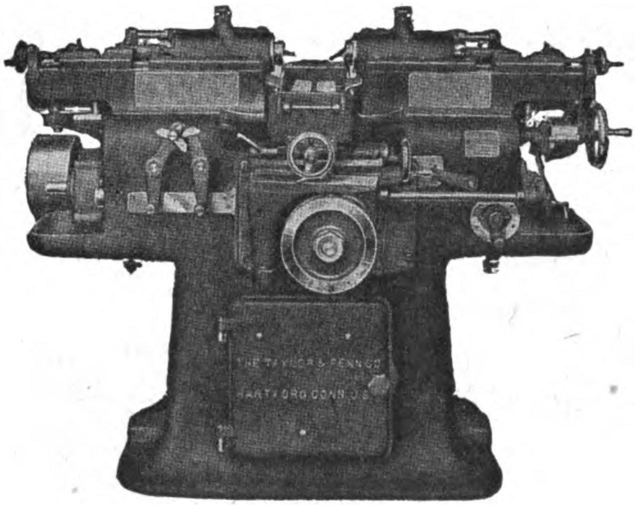

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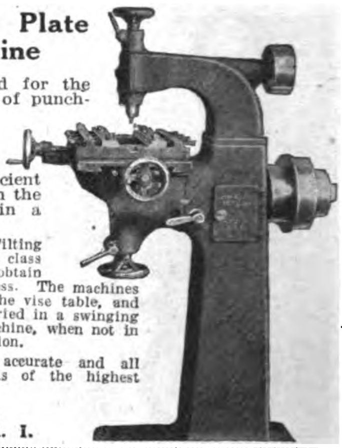

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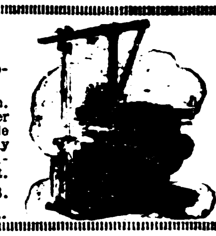

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Hall Planetary Thread Millers

Reduces threading cost 50% on some classes of work. Cuts all style threads internal or external.

Write for particulars.

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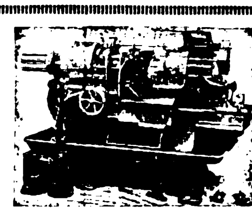
CINCINNATI 5-Spindle AUTOMATIC Screw Machine



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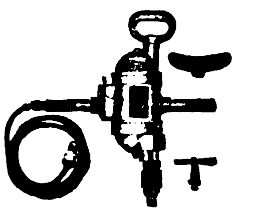
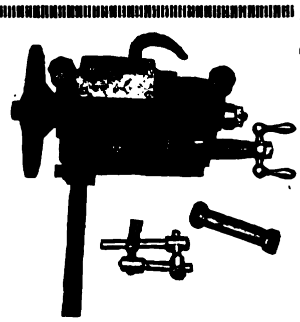


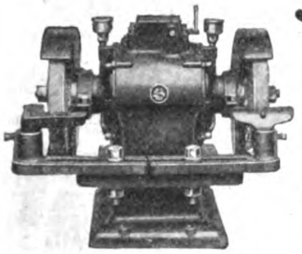
Two Sizes
⅜ in. Weight, 14 lbs.
½ in. Weight, 16½ lbs.

2



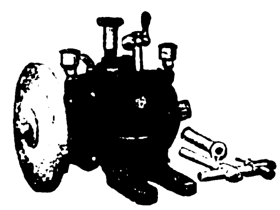
Type R—Center Grinder
Wheel 6 x ⅝ x ½ in.

3



3 Sizes—½ H. P.
1 H. P., 2 H. P.

4



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4 Sizes, ½—1—2 and 3 H.P.
Wheels 8 in. to 14 in.

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They have proved that lightness doesn't need to mean flimsiness. Today, a man who wants DEPENDABILITY—tools that neither smoke nor stall in steady usage—knows he can turn to

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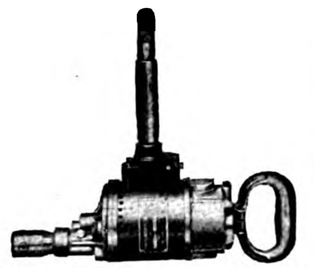
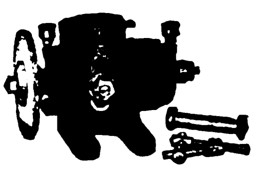
Cincinnati, Ohio

5



Type B Drill ¼ in. Metal ⅜ in.
Wood Weight 9 lbs.

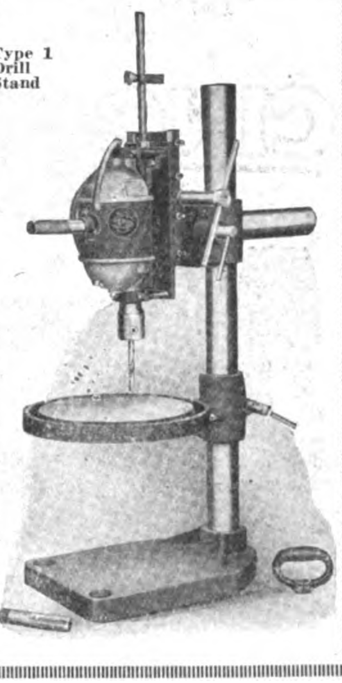
6



Type HB, Center Grinder
with Angle Plate

7

Type 1
Drill
Stand



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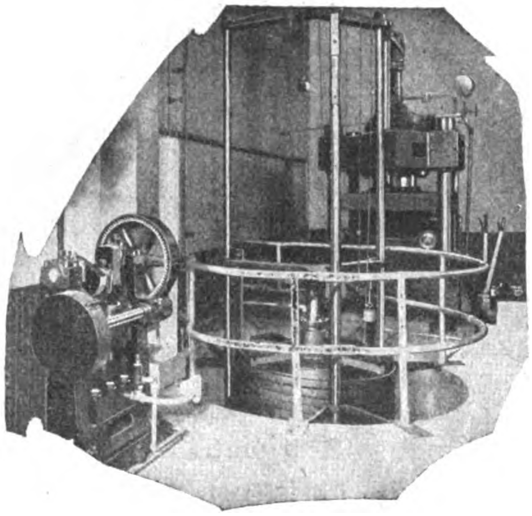
H-P-M



Offers Complete Service In Hydraulic Equipment

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"For Your Pressing Needs"

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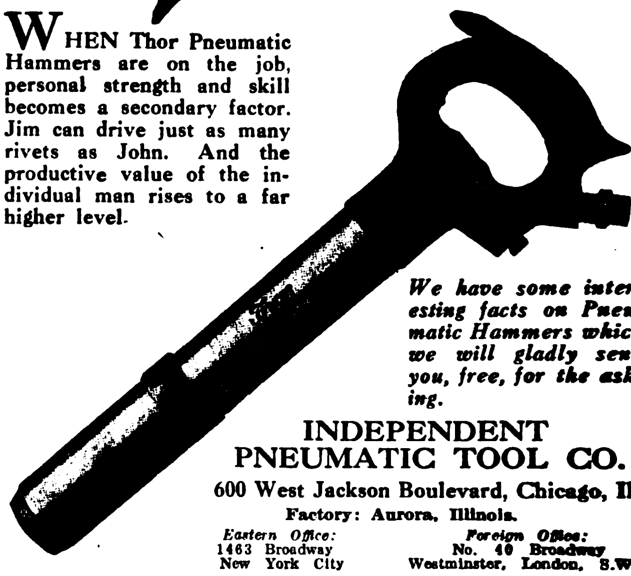
Pneumatic Hammers



WHEN Thor Pneumatic Hammers are on the job, personal strength and skill becomes a secondary factor. Jim can drive just as many rivets as John. And the productive value of the individual man rises to a far higher level.

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If it's a question of molding Bakelite, Condensite, Hard Rubber, or similar materials—ask us. No obligations. We have been specialists in this field for years, and can supply all kinds of presses and equipment.

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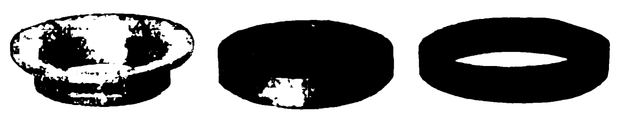

ELMES' packings are made of specially prepared leather to give them that "long wearing" quality. They stop the leaks.

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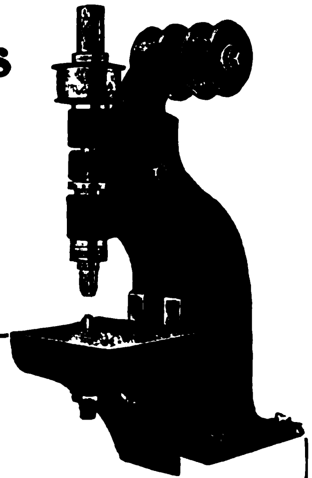

GRANT Rotary Riveting Machines can produce a perfect rivet head every second regardless of rivet size or metal from which it is made. Output is gauged only by the skill of the operator in handling the parts.

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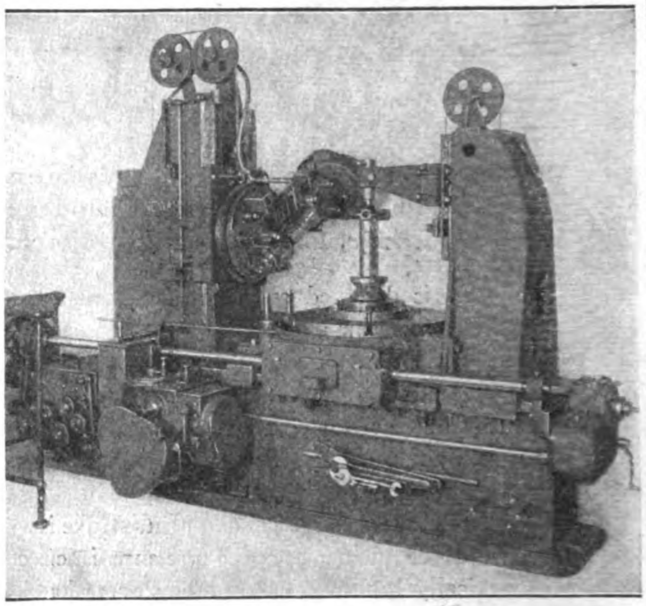

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The growing use of herringbone-gears demands that they be cut on the proper machine.

The NEWARK Hobbing Machine is designed just for such work as herringbone and helical gears. It saves time in setting up and in cutting; and time represents money. The gears are cut with the greatest accuracy.

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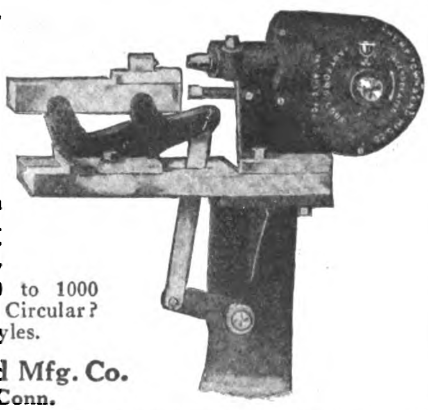

This machine is a wonderfully fast, convenient riveter for long or bulky work.. Strikes 80 to 1000 blows per second. Circular? Other types or styles.

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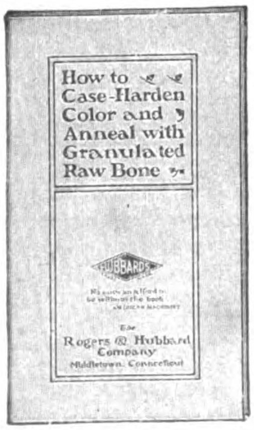

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[This is the first of a series of discussions of "Cutting and Progress."]

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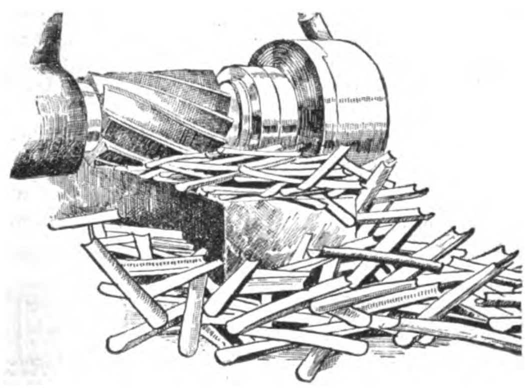

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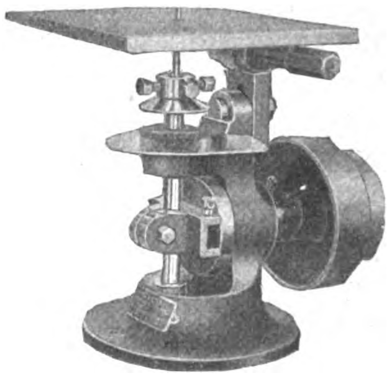

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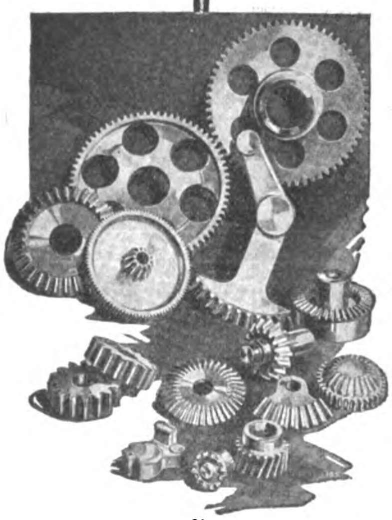

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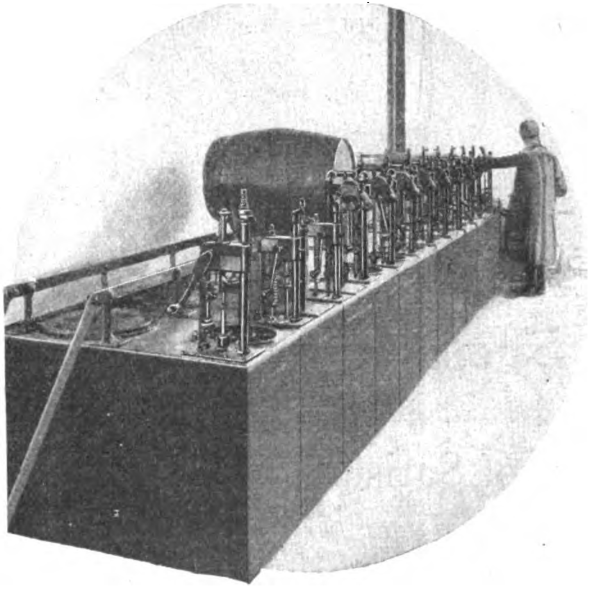


STEWART HIGH SPEED STEEL FURNACE
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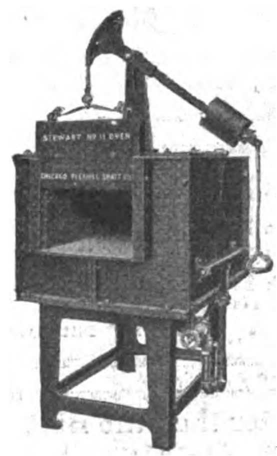
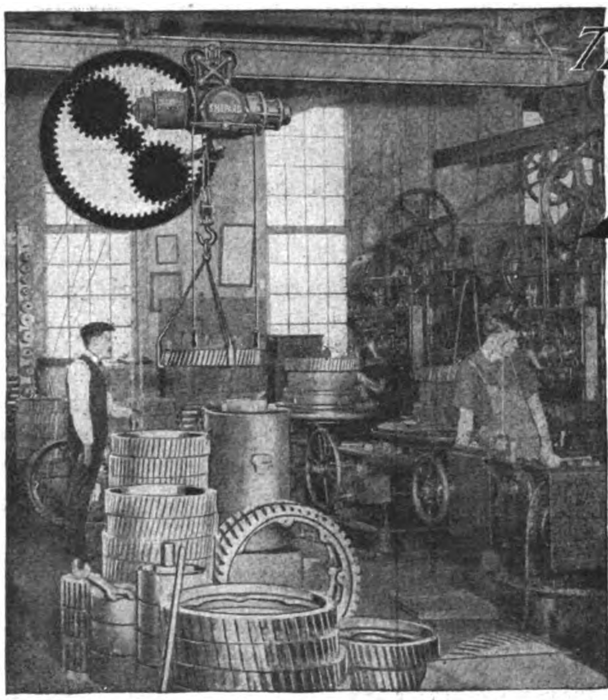
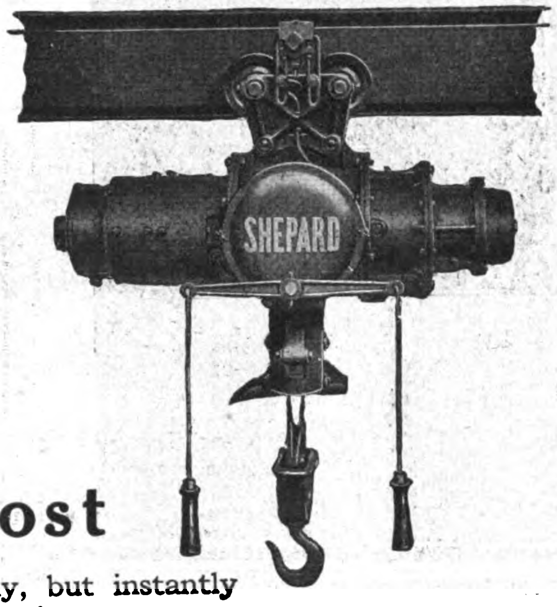




THE SHEPARD ELECTRIC LIFTABOUT



Big help at small cost

"THAT'S just what we've needed" has been said by hundreds in practically every business in all parts of the country when they learned of the Shepard Electric *LiftAbout*. They sought a cheaper, faster way for moving loads and found it in this new small, but powerful, electric hoist. This "Big help at small cost" will pick up, carry, and put down the loads that must be moved in your business — save labor and take your load moving item from the debit to the credit column.

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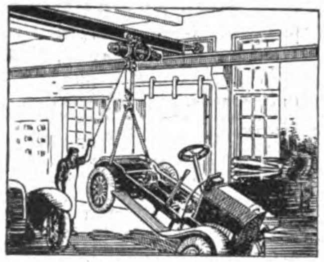

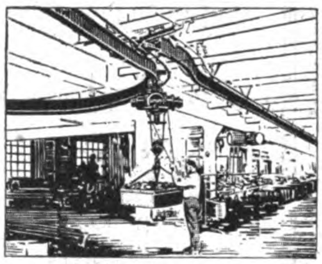

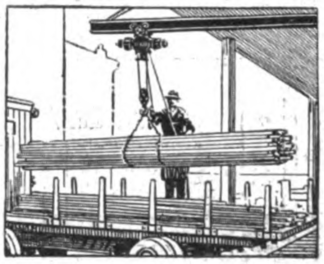

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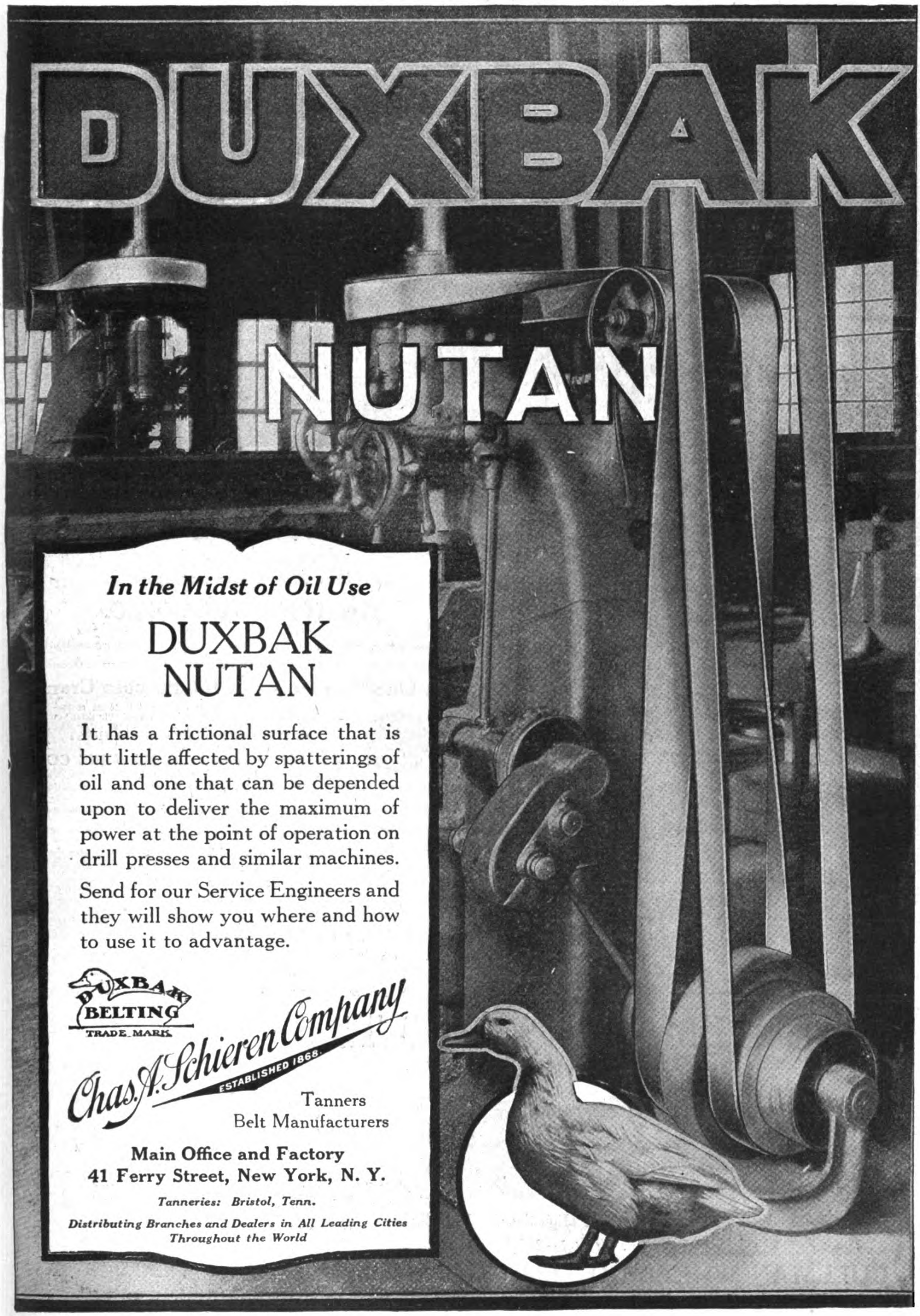
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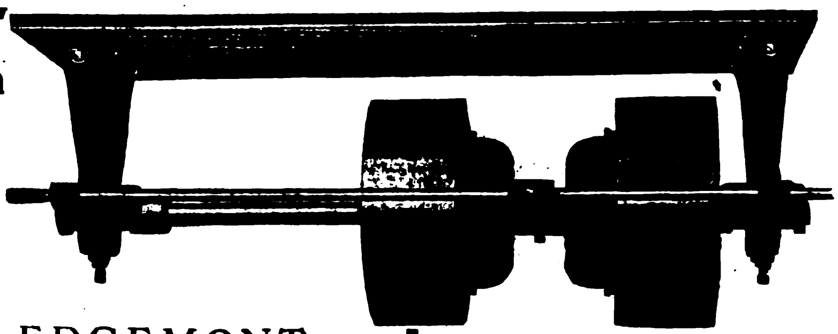

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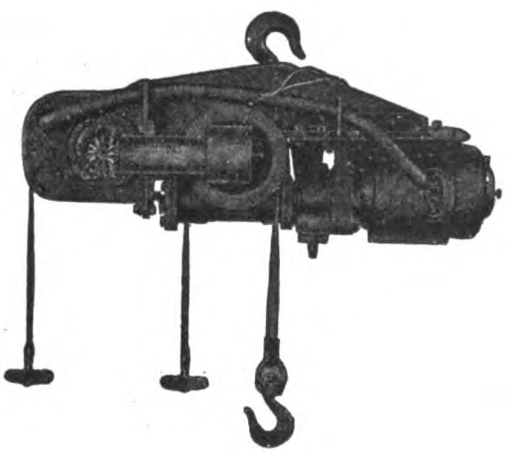

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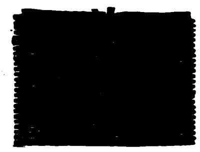

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For Block, Roller and High Speed Silent Chains

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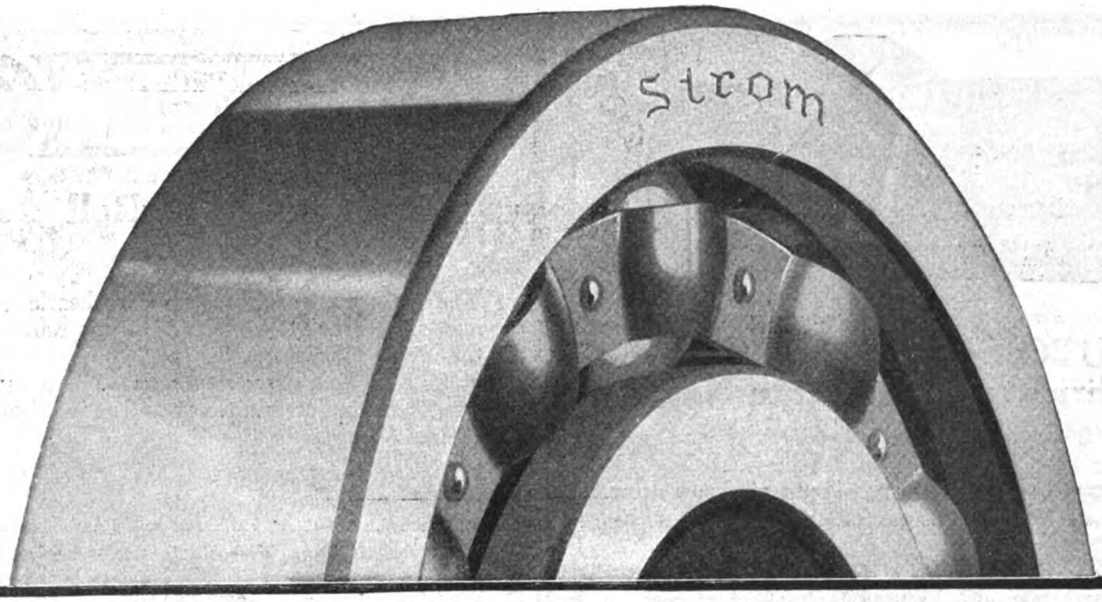

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You Will Find a STROM BEARING *to Fit That Need*

Strom Bearings are made in a wide range of sizes and types with the idea of meeting every bearing requirement.

They are correctly designed—carefully manufactured—thoroughly inspected—with the purpose of giving the highest degree of satisfaction. They are daily proving their serviceability under the most trying conditions in thousands of installations throughout the country.

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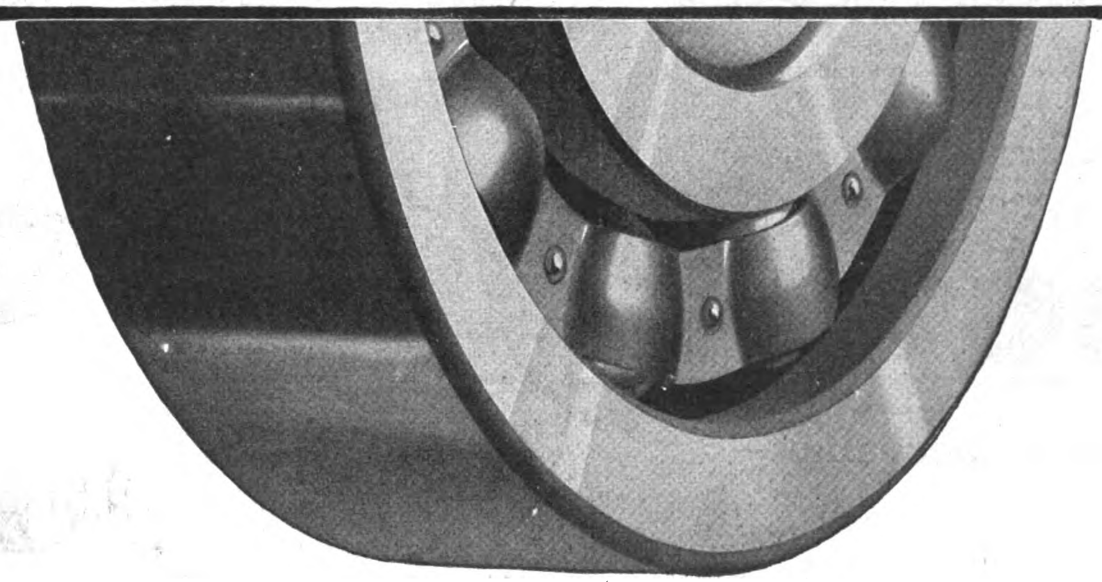

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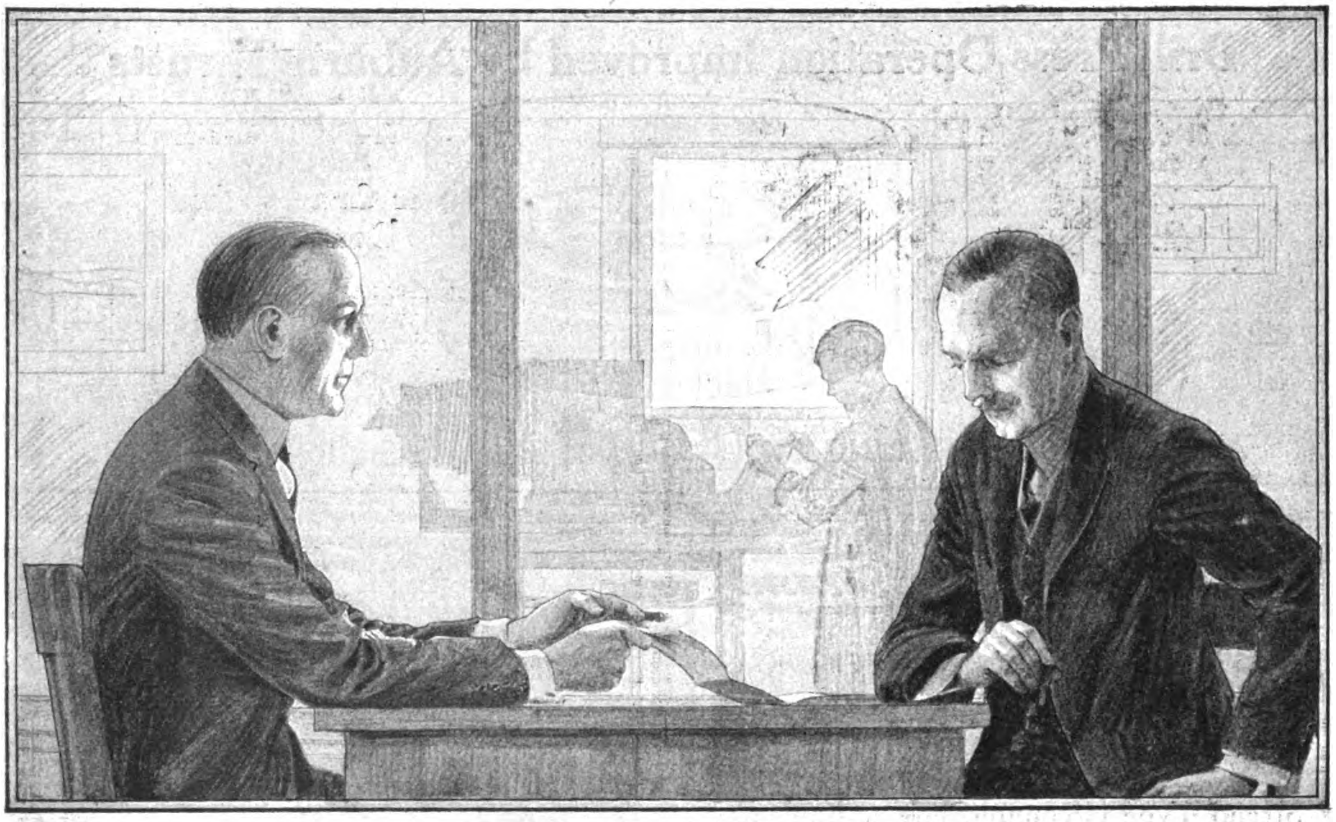
Strom BEARINGS *"Wherever a Shaft Turns"*



Drill Press Operation Improved by Auburn Thrusts

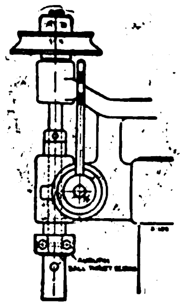


Fig. 11
The Small Sensitive Drill Press gives better service, when the thrust of the spindle is cared for by an Auburn Ball Thrust.

Steel, Brass and Bronze Balls.

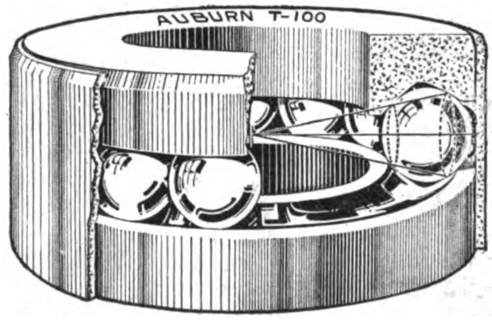


Fig. 13
The Heavy Radial Drill delivers more power to the drill point when the thrust is taken on an Auburn Ball Thrust Bearing.

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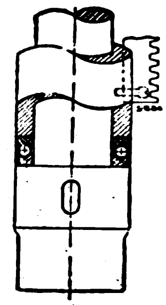
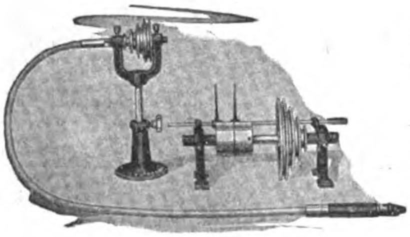
will improve your machine operation. Send particulars of your problem and ask for catalog.



AUBURN BALL BEARING CO. **25 Elizabeth St., Rochester, N. Y.**



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Equipment

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Agencies in all principal cities

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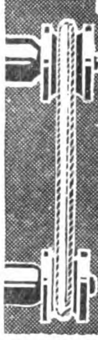

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PINTITE RIGID COUPLINGS For Line Shafting

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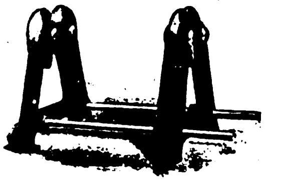
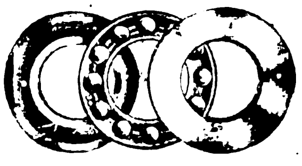


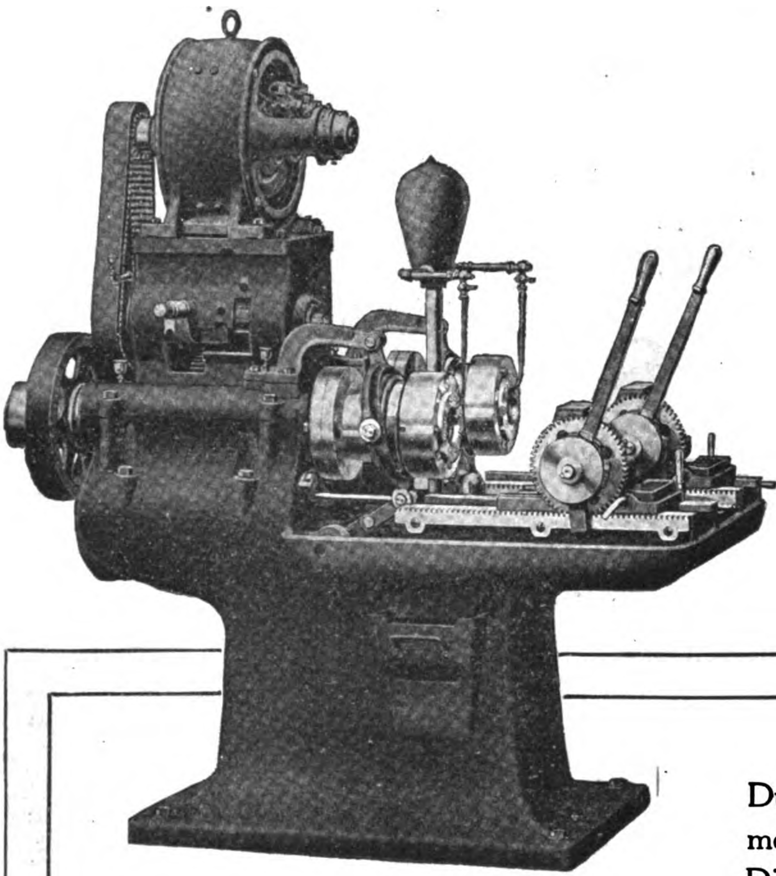
ANDERSON IMPROVED
BALANCING WAY
Made in various sizes for balancing Pulleys, Gin Brushes, Turbine Rotors, Crankshafts, Polishing Wheels, Flywheels, etc.
Anderson Bros. Mfg. Co.
1917 Kishwaukee St.
Rockford, Ill., U. S. A.

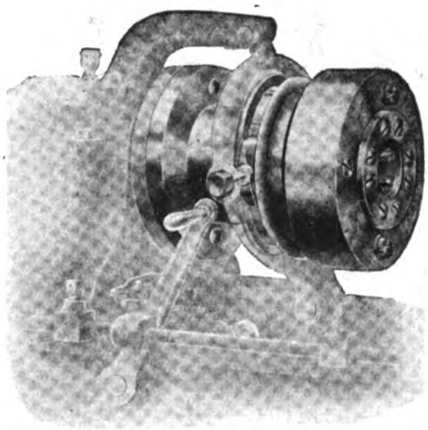


We offer the services of our engineers in assisting designers on layouts involving the use of Thrust Ball Bearings in any type of machine where Thrust Ball Bearings can be used. Our broad experience covers many years.

We are ready to serve you at any time.
We are prepared to manufacture Thrust Ball Bearings to your requirements.

The Bearings Company of America, Lancaster, Penna.
Western Sales Office: 1012 Ford Bldg., Detroit, Mich.





"Always Cut Accurate Threads"

Due to the positive locking mechanism of the National Die Head.

NATIONAL BOLT CUTTERS

always cut accurate threads. No wear can develop that is transmitted to the Dies, hence a high degree of accuracy is maintained thruout the life of the machine. (Your National will cut good, accurate threads after years of hard service as well as when new.)

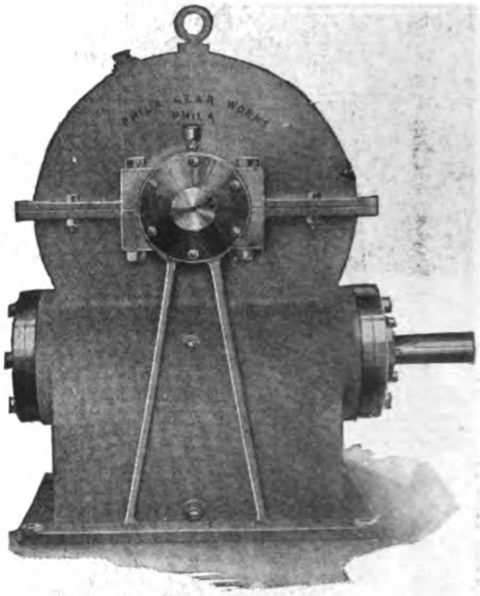
The simple Die Head design enables die change or adjustment in a minute's time, and no expert die setter or high-priced mechanic is required.

Also, comparison will reveal a 30% to 50% saving in die cost.

The National solves your threading problems.

THE NATIONAL MACHINERY CO., TIFFIN, OHIO, U.S.A.

Mills
in Massachusetts
Factories
in Frisco



Wherever there is need for an efficient speed reducing unit, there you will find **Philadelphia Worm Gear Drives.**

They cover the continent and there are some mighty good reasons for their predominance. Both worm and gear have generated teeth of our own design. The gear is made of Hi-Tensile Bronze and the worm of hardened steel. Ball bearings minimize friction and enhance quiet running.

Philadelphia Worm Gear Drives are designed especially to suit individual requirements, and will prove efficient and long lasting in service.

And don't forget Philadelphia Gears when in need of a superior product in a hurry.

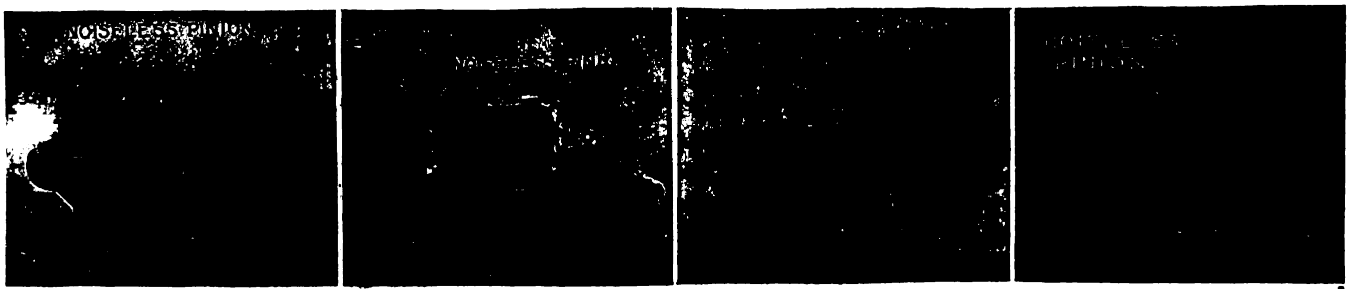
Did you get your copy of the *Phillie Gear Book.*

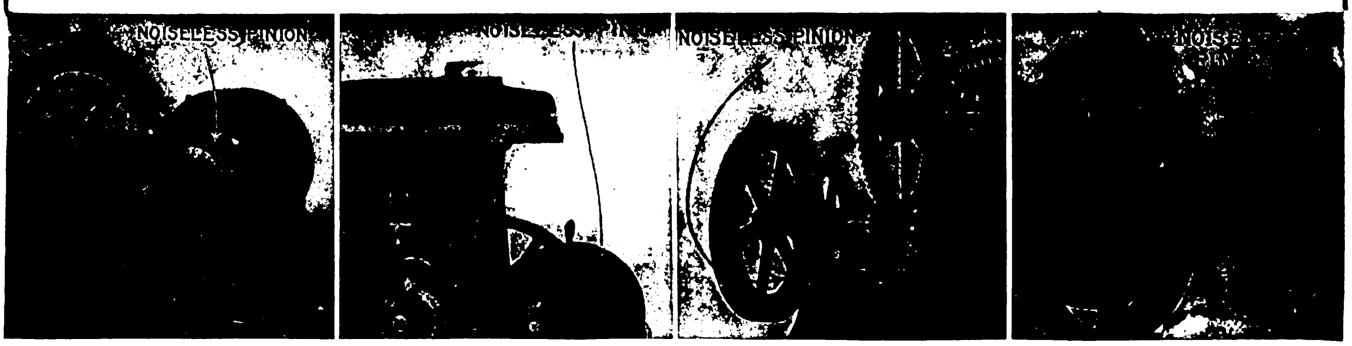
"Hurry Orders and Breakdown Jobs"
Immediate Attention

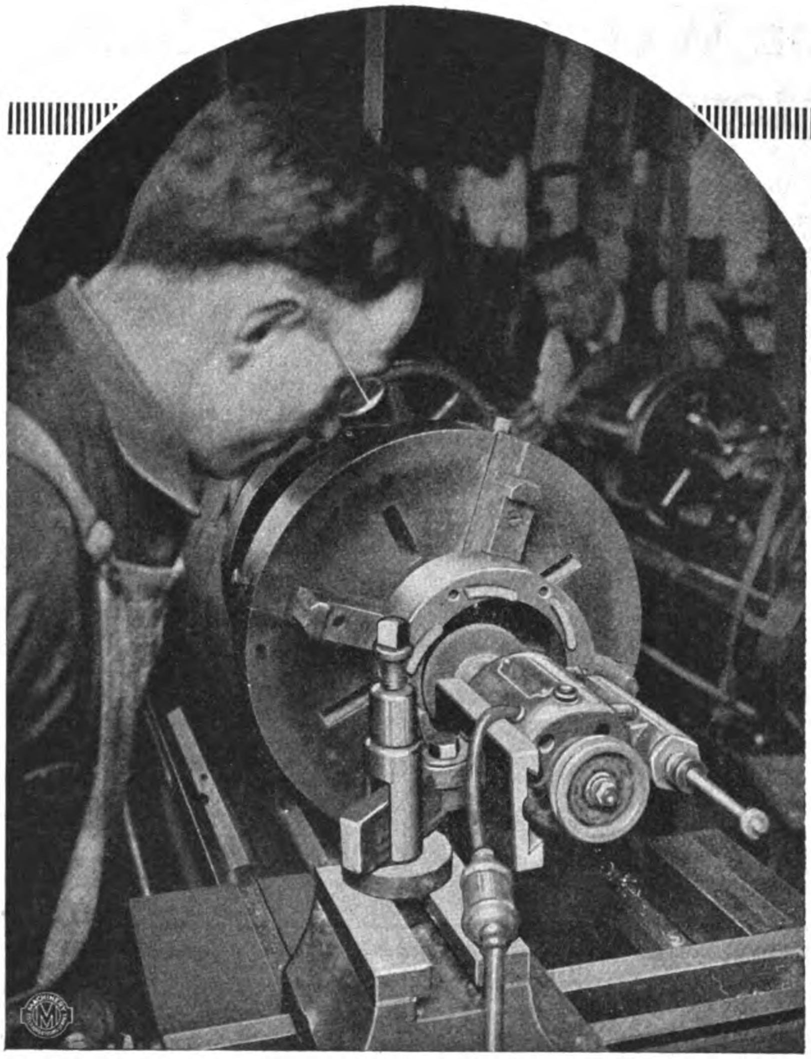
Spur — Bevel — Mitre — Spiral — Worm — Helical

Philadelphia GEAR Works, Phila. Pa.

Sprockets — Racks — Rawhide — Micarta — Gears







At the left is shown a DUMORE grinder attached to the toolpost of an engine lathe at the Geometric Tool Co., New Haven, Conn. A cam for a die lead has been just machined and the hole is being accurately ground without tearing down of the original "set-up." Result—faster work at a decreased operating cost.

Thousands Now In Use —*a tribute to* DUMORE *efficiency*

A FEW years ago the DUMORE line of high-speed grinders were new devices on the mechanical market. But today thousands of these better grinders have found their way into the tool rooms of the leading industries of the nation.

The many thousands of DUMORE grinders now in active service—their endorsement by the world's foremost mechanical experts—the numerous re-orders, *all* are tributes to the efficiency of DUMORE grinders more forceful than any other we know.

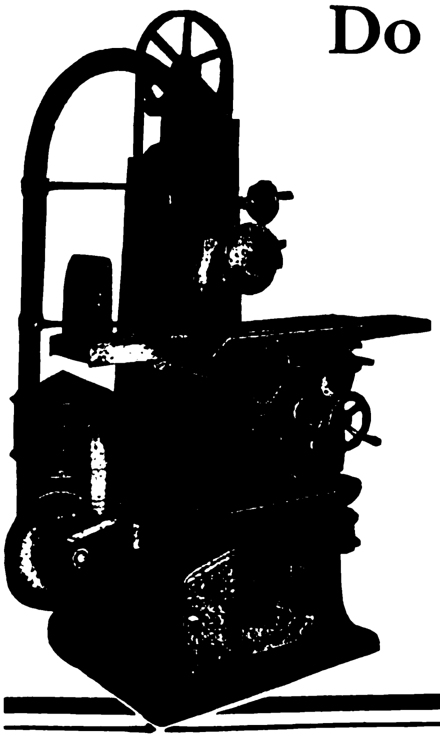
DUMORE grinders can meet *your* requirements for intricate grinding work as they have met the needs of over five thousand other industrial leaders. Set them up anywhere—use them for varied kinds of grinding. You'll find them equal to the task—performing swiftly, smoothly and accurately.

Be assured of correct cutting speed with a range of 10,000 to 30,000 R.P.M.—get accurate grinding to limits of .0001 in.—eliminate the costly need of tearing down original "set-ups" Put one or more of the DUMORE grinder family in your tool room!

Write today for complete information and descriptive literature—let your dealer demonstrate.

WISCONSIN ELECTRIC COMPANY
2745 Sixteenth Street, Racine, Wisconsin

DUMORE HIGH SPEED GRINDERS



Do Your Wet and Dry Grinding More Economically

"Abrasive" Surface Grinders make this possible. These machines have features that insure low cost, fast and accurate output. They are equally efficient on wet or dry grinding.

One reason they are so accurate is found in the heavy one-piece frame casting. This is 50% heavier than the frames of others and consequently is more rigid and less subject to vibration.

Let us show you how you can trim the cost of your grinding NOW.

Abrasive Machine Tool Co.

F. N. MacLeod, President and General Manager

East Providence, R. I., U. S. A.

FOREIGN AGENCIES—Andersen, Meyer & Co., Ltd., of China, Shanghai, China. Aux Forges de Vulcain, Paris, France. Burton, Griffiths & Co., London, England. Ateliers Demoor, Brussels, Belgium. Casamitjana Hermanos, Barcelona, Spain. J. Lambercier & Company, Geneva, Switzerland. Parke & Lacy Co., Ltd., Sydney, New South Wales. Selson Engineering Company, Milano, Italy. Wilh. Sonesson & Company, Malmo, Sweden. A. R. Williams Machinery Company, Toronto, Canada.

ABRASIVE

BRYANT CHUCKING GRINDER COMPANY

SPRINGFIELD, VERMONT

Reg. U. S. Pat. Off.

Builders of

Hole Grinders

Hole and Face Grinders

Deep Hole Grinders

Industrial Diamonds Can Be Used Economically

In buying industrial diamonds the thing that should interest you most is not the grade, or shape, or size of the stone. The minimum cost per operation is the thing that you should know.

Full details will be sent on request. Write for the book "Diamonds and Diamond Pointed Tools." It will be a valuable addition to your information library. It will be sent with any information you require, without obligation to you.

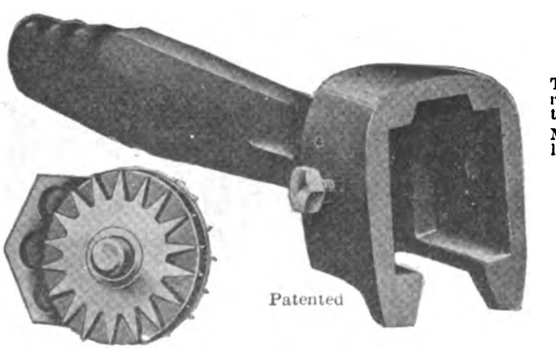
Address the home office when writing.

WHEEL TRUEING TOOL CO.

Importers of
Bortz & Carbon Diamonds
Manufacturers of
Diamond Tools for Every Mechanical Purpose
2129 PENOBSCOT BUILDING, DETROIT

Eastern Office: 527 Fifth Ave., New York City. Cleveland Office: 343 Engineers Bldg. Western Office: 1105 Great Northern Bldg., 20 Jackson Blvd. W., Chicago, Ill. Canadian Branches: Windsor, Ont., St. Catharines, Ont. Cable Address, "Wheeltruco" Detroit.

Don't Scrap the Dresser—Just Turn the Nut!

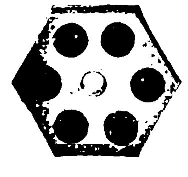


By a simple device, we have practically multiplied by six the life of the ordinary dresser. Note the design of the

Desmond—Hex Grinding Wheel Dresser

The inner side of the jaws of the dresser have been channeled to receive a removable hardened Hex Nut, in which are drilled six holes. These holes in the nuts act as bearings for the spindle carrying the cutters.

Made in two sizes—No. 1 for use on ordinary wheels—and No. 2 for use on large and coarse wheels. *Either size gladly sent on approval upon request.*



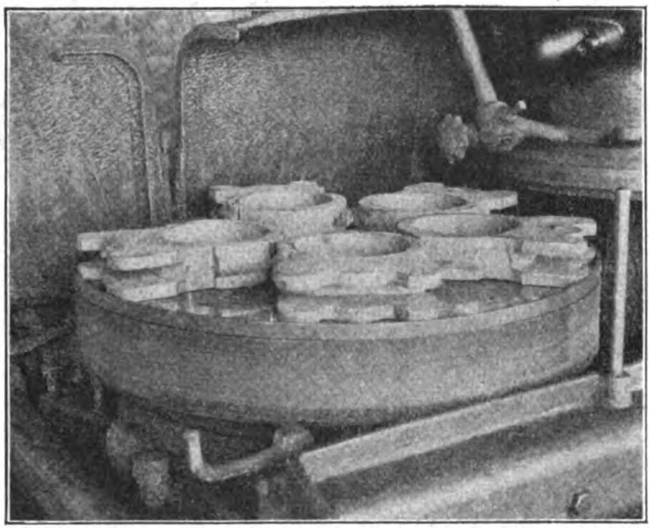
Desmond-Stephan Mfg. Co.

Urbana, Ohio

REPRESENTATIVES:

Canadian: Desmond-Stephan Mfg. Co., Ltd., Hamilton, Ontario

Alfred Herbert, Ltd., Conventry, England, Paris, Milan, Yokohama



Eccentric Strap Castings
$10\frac{7}{8}$ in. x $8\frac{1}{8}$ in. x $2\frac{1}{8}$ in.

No. 16 Blanchard Grinder
30 in. Magnetic Chuck
Material Cast Iron
Stock per side, $\frac{1}{8}$ in.

Limits, + .000 in.—.002 in.
No. of Sides, 2.
Production rate, per hour, 16 pieces (32 surfaces)

GROUND FROM THE ROUGH
ON
THE BLANCHARD GRINDER

The castings shown have from 3/32 in. to $\frac{1}{8}$ in. stock to be removed from each of the two sides. They are placed upon the powerful magnetic chuck of the number sixteen Blanchard Grinder and ground from the rough casting—just as they come from the foundry.

Not only does this machine produce in one operation two accurately flat surfaces from which all subsequent operations are located, but the production is better than obtainable by other methods of machining.

Examine those production figures! Can you beat them in your shop?

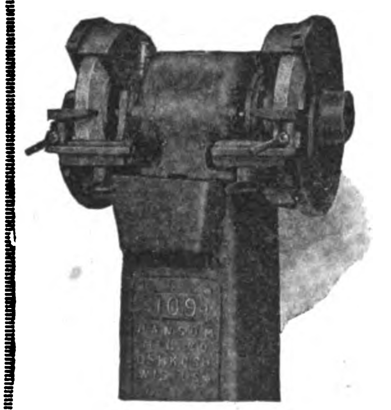
"A BETTER PRODUCT FOR LESS MONEY."

You have plane surface jobs which should cost less—Send us blue prints of them.

THE BLANCHARD MACHINE COMPANY
64 State Street **Cambridge, Mass., U. S. A.**

REPRESENTATIVES: UNITED STATES: Henry Prentiss & Co., Inc., Motch & Merryweather Co., Marshall & Huschart Machinery Co., W. E. Shipley Machinery Co., Kemp Machinery Co., Robinson, Cary & Sands Co., Pacific Tool & Supply Co., The Hendrie & Bolthoff Manufacturing & Supply Company. CANADA: Williams & Wilson, Ltd., F. F. Barber Machinery Co., GREAT BRITAIN: C. W. Burton, Griffiths & Co. FRANCE: Aux Forges de Vulcain. ITALY, SWITZERLAND, BELGIUM, SPAIN and PORTUGAL: Allied Machinery Co. of America. SWEDEN: A. B. Rylander & Asplund.

BLANCHARD



Handy Tool Grinder

The 109 Ransom Ball Bearing Grinder occupies little space, can be placed in any convenient place, requires little attention, and automatically stops when not in use.

The grinder is started by stepping on either of the two pedals located at the base of the machine in the most convenient position for the operator. When the foot pressure is released it automatically stops. There can be no forgetting to stop the machine. Enclosed cast iron guards, as illustrated, are regularly furnished. Write for specifications.

Ransom Mfg. Co.
Oshkosh, Wis.

Precision Grinders Speed Production
Write for Catalog.
Wilmarth & Morman Company
Master Grinder Makers.
1187 Monroe Avenue, N. W.
Grand Rapids, Michigan.
Drill Grinders—Universal Grinders
Surface Grinders

BADGER GRINDERS

The recently designed Badger Grinder, incorporating many practical ideas which are the result of years of experience, places the disc grinder on the list of necessary machine tools.

Disc Grinder information gladly furnished.

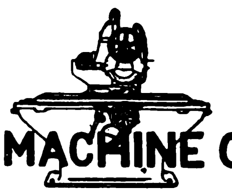
Badger Tool Co., Beloit, Wis., U. S. A.
E. B. Gardner, Pres. "Disc Grinder Service": R. D. Gardner, Treas.

When You Think of a Disc Grinder, Think of a

GARDNER

Gardner Machine Co., Beloit, Wis., U. S. A.

Grinding Machinery



Polishing Machinery

DIAMOND MACHINE CO., Providence, R.I.

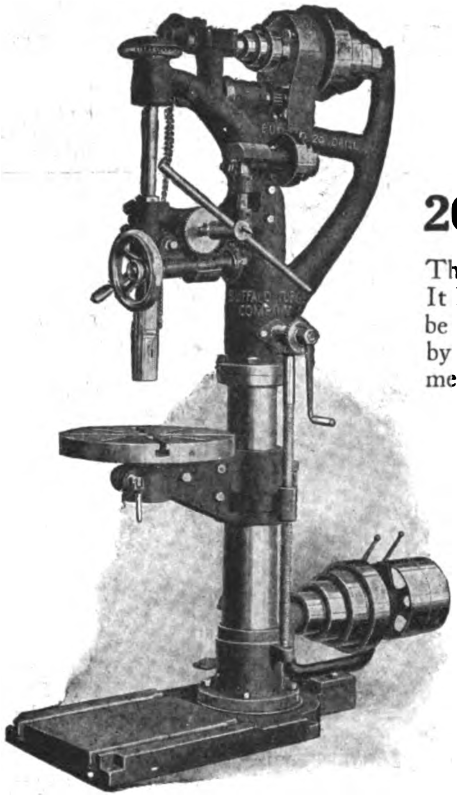
Knee Type Ring Wheel GRINDER For Flat Surfaces

The* GRAHAM MFG. CO., *Providence, R.I.

ETNA Swaging Machines

We build Swaging Machines in capacities from $\frac{1}{4}$ to $4\frac{1}{2}$ inches. *Write for the descriptive matter.*

THE ETNA MACHINE CO., Toledo, Ohio



"Buffalo"

20-in. Back Geared Upright Power Drill

This Drill is designed in every respect to do accurate and efficient work. It has eight speeds and three power feeds, also hand and lever feeds. Can be instantly changed from plain to back geared drive without using wrench by disengaging knurled knob in the top gear and throwing in back gears by means of hand lever. A locking screw is also provided to hold this in place.

SPECIFICATIONS

Height of Drill............74 in.
1½ inch hole to Centre......20 in.
Circle. Greatest distance between Base and Spindle. 41½ in.
Greatest distance between Table and Spindle......25½ in.
Diameter of Table........15½ in.
Size of Tight and Loose Pulley................8 x 3 in.
Speed of Drive Pulleys.300 R.P.M.
Smallest Diameter of Cone Pulley....................4 in.
Largest Diameter of Cone Pulley....................9 in.
Depth of Cone Pulley Steps.2⅛ in.

Buffalo Forge Company
Buffalo, N. Y., U. S. A.

Blowers, Forges, Drills, Exhausters, Punches and Shears, Heating and Ventilating Apparatus

---

TURNER TURRET

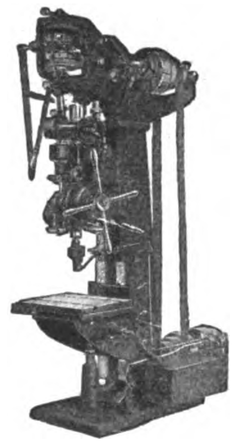
It is adaptable to a wide range of work. Each spindle carries a different tool. All register in the same position. Simple and easy to operate. Increases output, reduces cost, insures quality In use all over the civilized world.

Ask for Bulletin

We also manufacture the Quint Turret

Turner Machine Company
Danbury, Conn.

FOREIGN REPRESENTATIVES: Burton, Griffiths & Co., Ltd., 64-70 Vauxhall Bridge Road, London, for Great Britain, and Allied Machinery Company of America with offices in France, Belgium, Switzerland, Italy, Spain, Portugal.

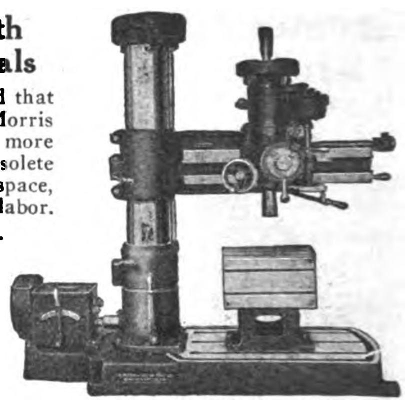


Replace 5 "old-timers" with 3 Morris Radials

and you'll probably find that the three up-to-date Morris Radials will do much more work than the five obsolete tools—using less space, power, supervision and labor.

Make us prove it—Now's the time!

The Morris Machine Tool Company
Cincinnati, Ohio
Niles-Bement-Pond Co., 111 Broadway, N. Y.



The Mueller Machine Tool Co.

Cincinnati, Ohio

Radial Drills and Lathes

Write or particulars

FOSDICK

High Speed Ball Bearing Sensitive Drills and Heavy Duty Radials

Advanced design and high grade construction make them the logical tools to use for efficient, low cost production. Investigate.

The Fosdick Machine Tool Company
Cincinnati, Ohio, U. S. A.

Highest Efficiency—Utmost Economy

"Hole Hog" Multiple Drillers and Borers increase the output and reduce production costs. Save in every direction. Increase the capacity of your plant by using "Hole Hogs" instead of building an addition. Tell us your needs.

MOLINE TOOL COMPANY, Moline, Illinois

MINSTER HI-DUTY DRILLING MACHINES

BUILT IN FOUR DIFFERENT SIZES

Write for Bulletin No. 30

MINSTER MACHINE CO.
MINSTER, OHIO, U. S. A.

Competition Is Enforcing the Use of Mechanically Correct Equipment

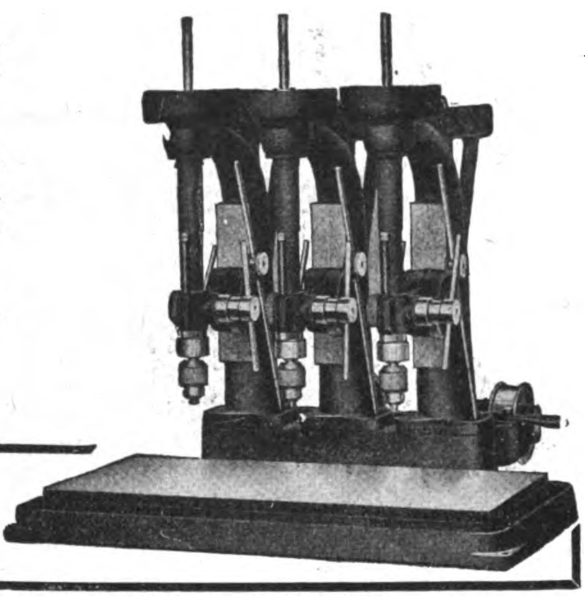
The methods of yesterday are not to be thought of today if you are to continue in business without loss.

A big percentage of your machining time is devoted to hole drilling and producing costs are raised or lowered according to the methods you employ.

Leland-Gifford Sensitive Drilling Machines give you more holes per hour. They will drill at spindle speeds anywhere from 3,000 to 10,000 r.p.m. and will maintain any of these speeds practically indefinitely.

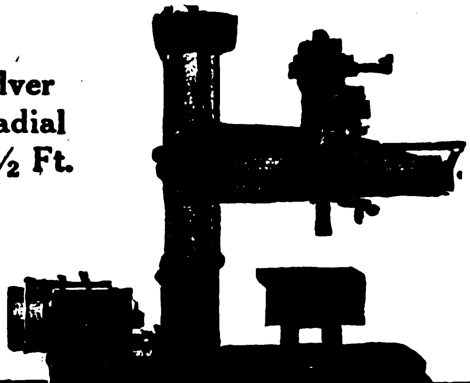
There are unlimited production possibilities in these machines.

Ask us to forward details.



Leland-Gifford Co.
Worcester, Mass., U. S. A.

Silver Radial 3½ Ft.



Here's the King of Hole-Makers!

Silver Radial

Over 65 years of experience have gone into this machine, the peer of them all, regardless of purchase price.

COLUMN has extra wide bearings at top, bottom and center. Heavy ribs give unusual rigidity.

BOLT to which arm clamping lever is attached not only acts as a limit screw to prevent sagging, and a binder, but prevents starting elevating screw while arm is clamped to column.

AUXILIARY DRIVE between pulley and cone shafts keeps cone gears running very slowly in changing gears—no shock.

Catalog tells the full story—Send for it

The Silver Mfg. Company
Box 360—Salem, Ohio
Established 1854

No Time Out for Attention

Continuous Service means **Continuous Profit.**

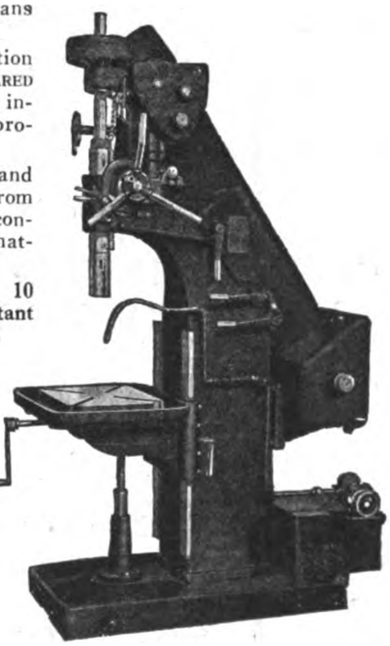
This high production **Self-Oiling** ALL GEARED **Drill and Tapper** will increase your shop's productive capacity.

All important gears and **all bearings** (aside from spindle sleeves) are continuously oiled automatically.

8 Geared Speeds; 10 Geared Feeds; Instant Change; No Cone Belts.

Capacity: ½ in. to 2 in. high-speed drills.

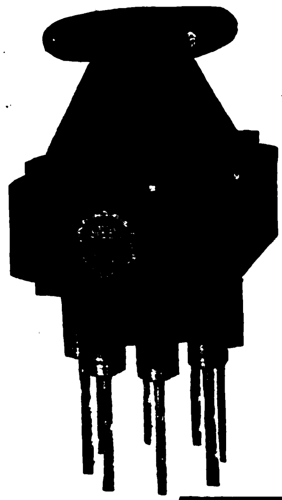
Built for rapid production and heavy-duty work. Let us prove to you that it is unequaled in production and in cost cutting.



Have you looked over Catalog A?

Barnes Drill Co., Inc., 1907
830 Chestnut St., Rockford, Ill., U. S. A.

AGENTS FOR GREAT BRITAIN: Burton, Griffiths & Co., Ltd., London, E. C. FRANCE: R. S. Stokvis & Fils, Paris. JAPAN: Roku Roku Shoten, Tokyo. ITALY: Alfred Herbert, Ltd., Milan. NEW SOUTH WALES. R. L. Scrutton & Co., Sydney. BELGIUM: G. & F. Limbourg, Freres, Brussels. SPAIN and PORTUGAL: American Machinery Corporation, S. A. E., Madrid. Sindicato de Marquinaria Americana, Bilbao.



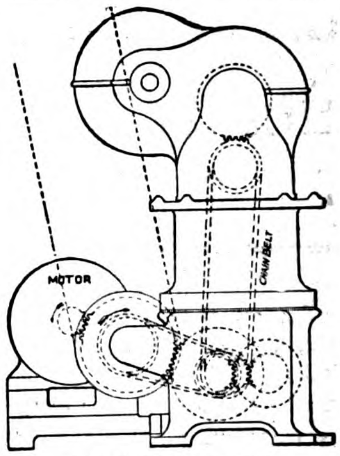
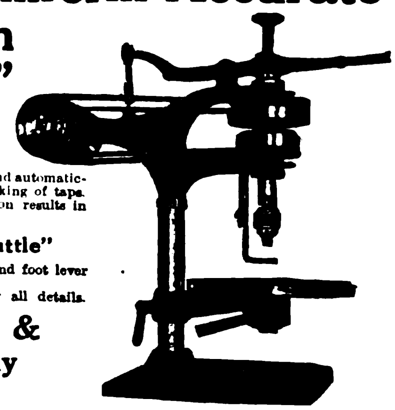
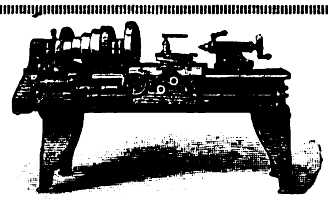
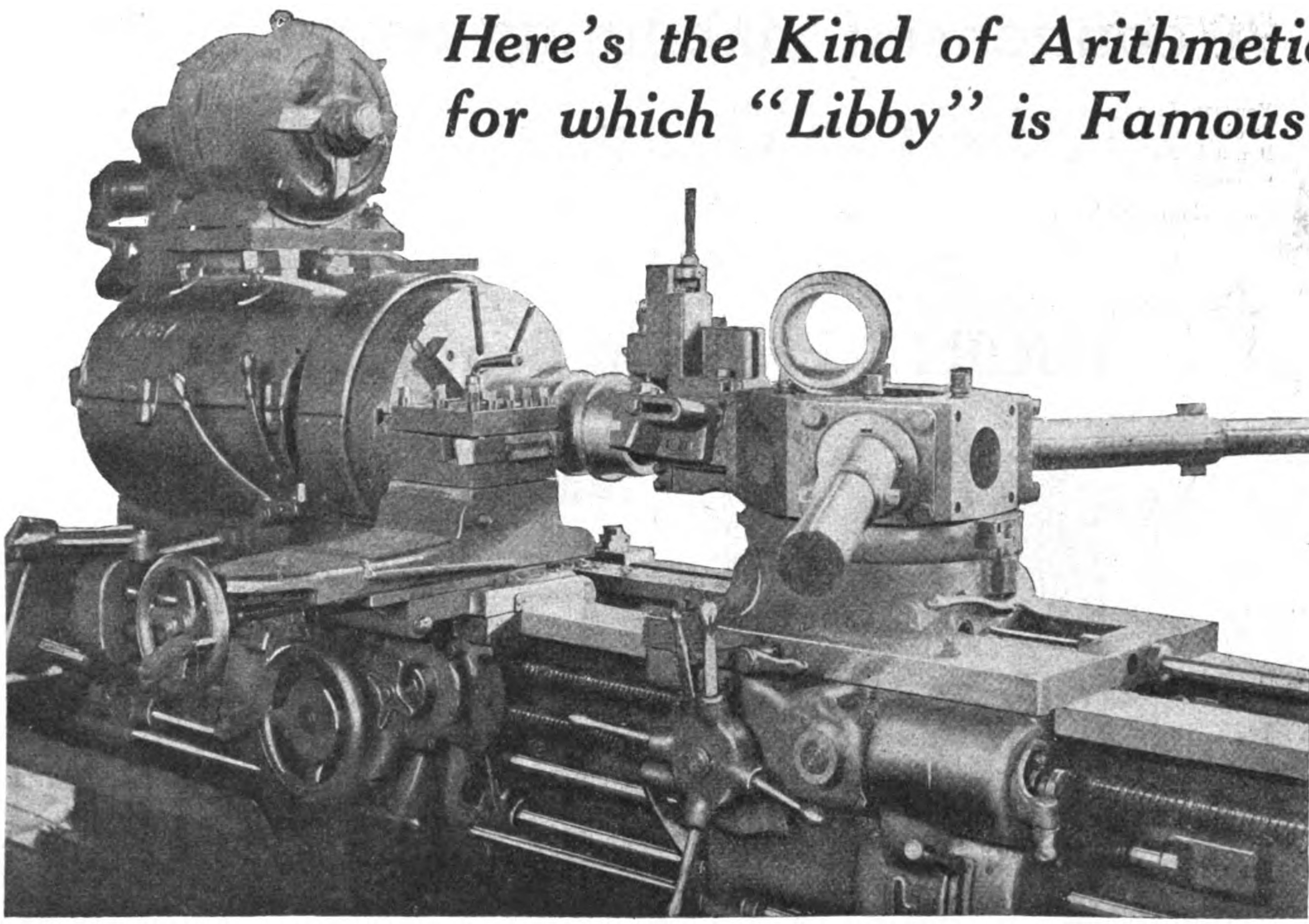


Fig. 1. End Elevation "Showing down-pull"





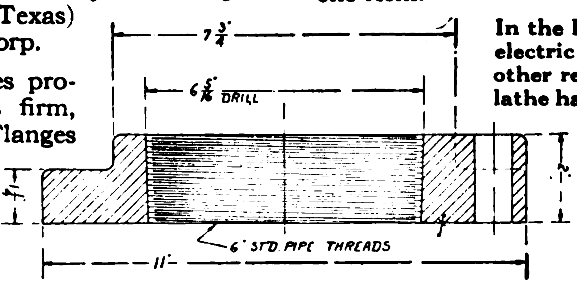
Here's the Kind of Arithmetic for which "Libby" is Famous!



Reducing 64 cents to 11 cents in the Oil Field

Behind the vast American industry that produces much of the world's oil supply is another vast industry—it's that of oil well supply and repair. That Libby Lathes are setting a new standard of efficiency in this as in scores of other fields, is made plain by the story of *"Libby"* service on the Houston, (Texas) plant of the Lucey Mfg. Corp.

Among the oil well supplies produced in quantity by this firm, are what they call Suction Flanges per sketch on this page.



Prior to installing "Libby" Lathes, the labor alone for machining these parts cost them 64c. each. On the "Libby" Lathe the labor cost is 11c. each, a saving of $21.20 per day on labor or $53.00 per day on labor and overhead.

The investment is more than twice paid for in savings in one year, while the "Libby" is still good for many years' service.

Much to your surprise, you'll find the "Libby" paying big dividends on comparatively small runs in small shops as well as in year-round production of one item.

In the largest automotive, railroad, electric motor plants and scores of other representative industries, this lathe has been a big factor in getting costs down to a "deflation" level.

You'll be interested in the details behind the performance of this glutton for hard work. A "Libby" production estimate will cost you nothing, and will help you check up the efficiency of your present equipment. Write today.

International Machine Tool Co., Indianapolis, Ind.

DOMESTIC AGENTS:—Aumen Machinery Co., Baltimore, Md.; Blackman-Hill-McKee Machinery Co., St. Louis, Mo. Brown & Zortman Machinery Co., Pittsburgh, Pa.; Eccles & Smith Co., San Francisco, Calif., Eccles & Smith Co., Los Angeles, Calif.; Eccles & Smith Co., Portland, Ore.; Eccles & Smith Co., Seattle, Wash.; E. L. Essley Machinery Co., Chicago, Ill.; E. L. Essley Machinery Co., Moline, Ill.; E. L. Essley Machinery Co., Milwaukee, Wis.; Hill, Clarke & Co., Boston, Mass.; Northern Machinery Co., Minneapolis, Minn.; Seifreat-Woodruff Co., Cincinnati, Ohio; Seifreat-Woodruff Co., Dayton, Ohio; Strong, Carlisle & Hammond Co., Detroit, Mich.; Strong, Carlisle & Hammond Co., Cleveland, Ohio; Syracuse Supply Co., Syracuse, N. Y.; Syracuse Supply Co., Buffalo, N. Y.; Syracuse Supply Co., Rochester, N. Y.; Vandyck Churchill Co., New York, N. Y.; Vandyck Churchill Co., New Haven, Conn.; Vandyck Churchill Co., Philadelphia, Pa.

A condensed machining department

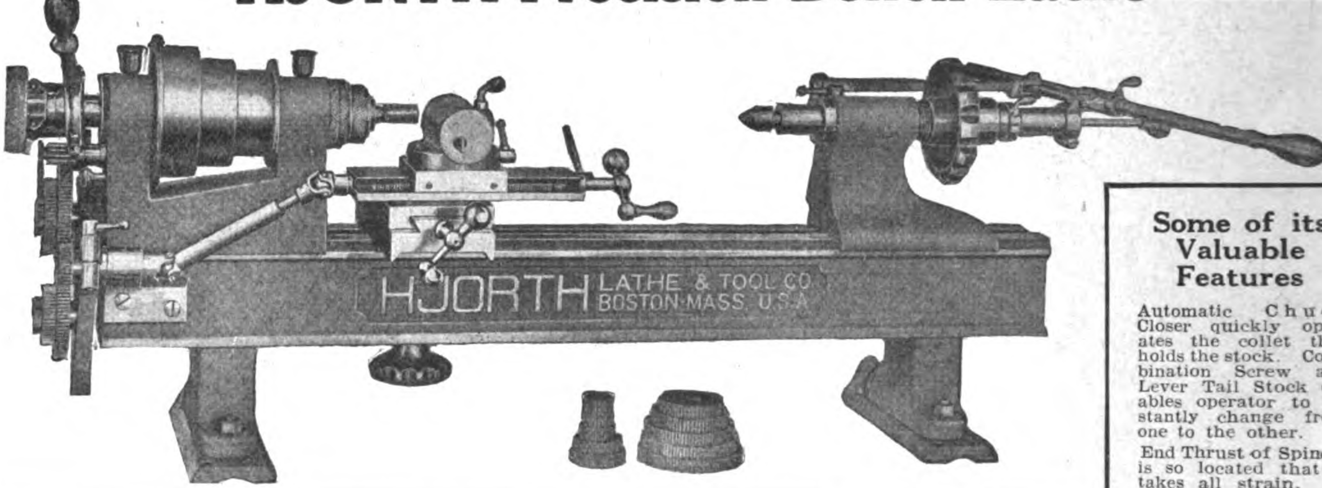
You can do a goodly portion of your small and medium drilling, milling, grinding, etc., on the **Hjorth Precision Bench Lathe** and thus economize by preventing the tie-up of large machines with small jobs.

Its various attachments broaden its range far beyond that of the ordinary precision bench lathe and are quickly and easily attached.

All the bearings of this lathe and its attachments are scraped to a master standard gauge, so that each attachment fits accurately.

Let us show you how ably and economically this lathe will handle many of your machining operations.

HJORTH Precision Bench Lathe



Some of its Valuable Features

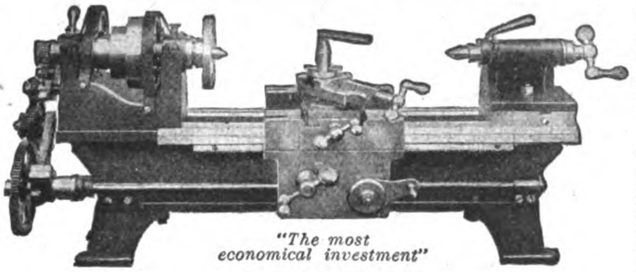
Automatic Chuck Closer quickly operates the collet that holds the stock. Combination Screw and Lever Tail Stock enables operator to instantly change from one to the other.

End Thrust of Spindle is so located that it takes all strain.

Patented T Rest has binder down low out of the way of the hand tool.

Hjorth Lathe & Tool Co. General Offices: 27 School St., Boston, Mass. Works: Woburn, Mass.

THE JOHNSTON LATHE

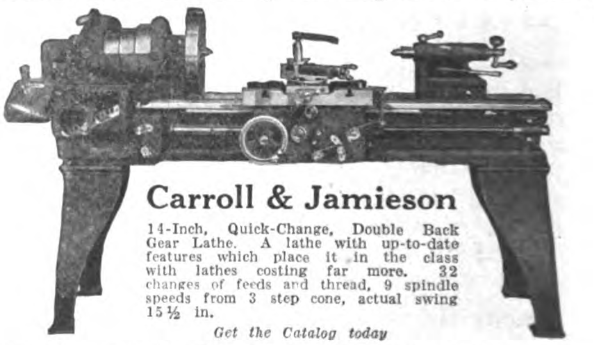


"The most economical investment"

The lathe designed for machine shops, garages, Manual Training Schools, and the home. Actual swing 9½ in., between centers 17½ in., hole in spindle ¾ in. Send for more information.

MONITOR LATHE WORKS, Arlington, N. J., U. S. A.

Where Can You Buy Its Equal for $450?



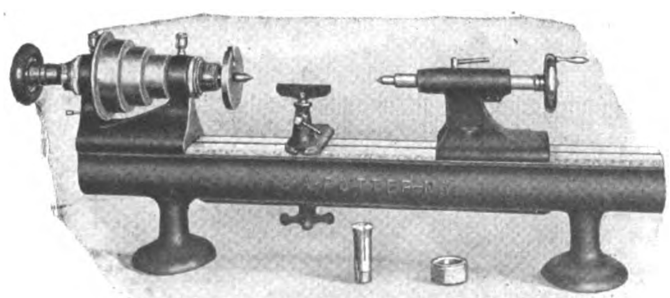
Carroll & Jamieson

14-Inch, Quick-Change, Double Back Gear Lathe. A lathe with up-to-date features which place it in the class with lathes costing far more. 32 changes of feeds and thread, 9 spindle speeds from 3 step cone, actual swing 15½ in.

Get the Catalog today

The Carroll & Jamieson Machine Tool Co.
Davis Ave., Batavia, Ohio

Expensive Equipment Boosts Producing Costs



Overhead and supervision add to the cost of every piece you produce in your lathe department. The **Potter Precision Bench Lathe** is inexpensive to install, extremely easy to operate and insures close accuracy.

In both tool room and manufacturing department its performance makes for greater profit.

Let us show you how the "Potter" lowers producing costs.

S·A·POTTER NEW YORK BENCH LATHES

S·A·Potter Tool & Machine Works
75 East 130th St.
New York City

Write For This Book It Contains Useful Information For The Production Engineer

So-swing

THE So-swing LATHE

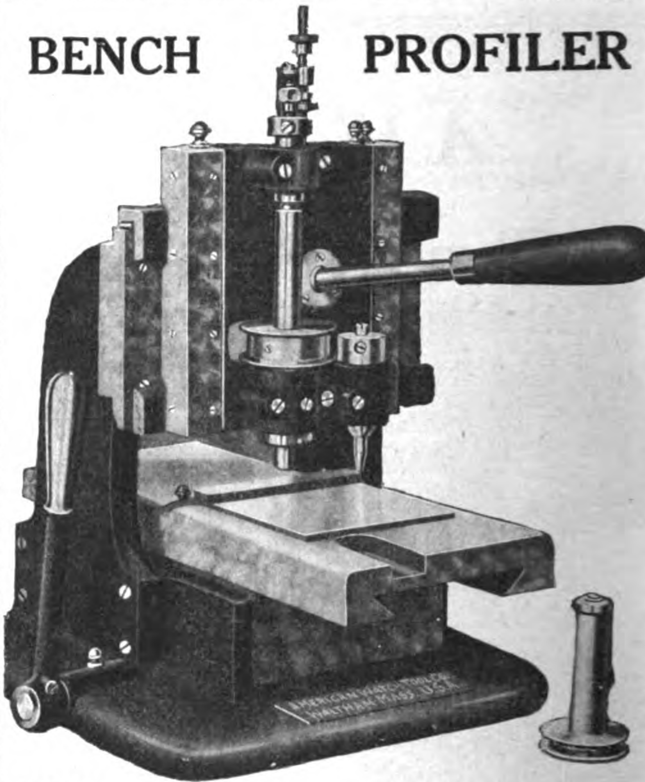
AT WORK

Fitchburg Machine Works
FITCHBURG, MASSACHUSETTS, U. S. A.

So-swing

FITCHBURG MACHINE WORKS
FITCHBURG, MASS.
U.S.A.

BENCH PROFILER



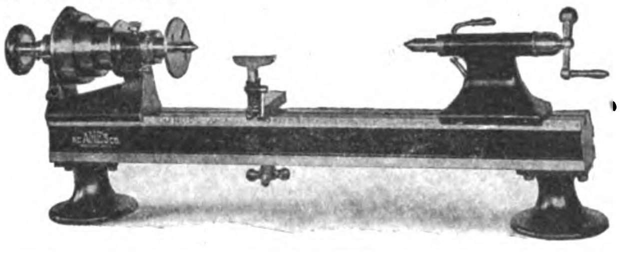
YOU can use this machine for recessing watch plates, die work, rifle and typewriter parts, cams, etc., where accurate duplication of form is essential.

THE WADE AMERICAN TOOL COMPANY
49-59 River St., Waltham 54, Mass.

You Can Profit By Its Use

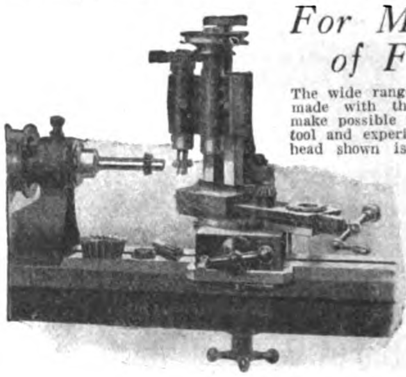
The Ames Bench Lathe is saving money in numerous plants on small and medium sized work. With our interchangeable attachments you can do turning, drilling, grinding, milling and thread cutting with unexcelled accuracy and economy. Write for our literature.

BC AMES CO
WALTHAM MASS U S A



Elgin Lathe Attachments

For Many Classes of Fine Work



The wide range of attachments which are made with the Elgin Precision Lathes make possible the greatest variety of fine tool and experimental work. The milling head shown is but one of many Elgin Attachments. It is adaptable to all customary miller operations and is of a quality and accuracy in keeping with the Elgin Bench Lathe.

Send for complete catalogue.

Elgin Tool Works
Elgin, Ill.

"Oliver" Engine Lathes

10—12—16—18—26—30-Inch

OLIVER

Rapid Production Lathes
Multi-cut Lathes

Oliver Machinery Co.
Grand Rapids, Mich., U. S. A.

Sidney Service Always

Lathes designed and built to give the right kind of service.

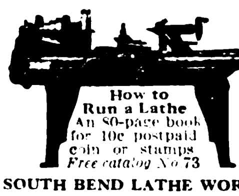
Lathes sold with advice. Particulars on request.

The Sidney Machine Tool Co.
Sidney, Ohio, U. S. A.

Rapid Production **HAMILTON** *Machine Tools*

Hamilton Lathes, built in a wide range of sizes and styles, reach the peak of modern precision—plus—production. Their economy, viewed from any angle, makes it advisable for you to get complete description at once.

THE HAMILTON MACHINE TOOL CO.
Hamilton, Ohio, U. S. A.



REDUCED PRICES
SOUTH BEND LATHES

Size of Lathe	Standard Change Gear	Quick Change Gear
9 in. x 3 ft. Lathe	$176 00	$216.00
11 in. x 4 ft. Lathe	228 00	273.00
13 in. x 5 ft. Lathe	304 00	354.00
15 in. x 6 ft. Lathe	376 00	431.00
16 in. x 8 ft. Lathe	452 00	512.00

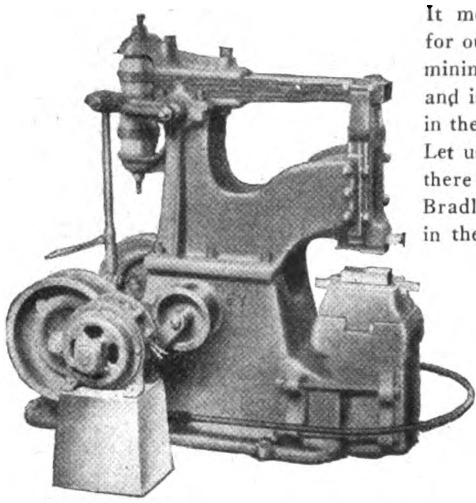
also 18 in., 21 in. and 24 in. swing

SOUTH BEND LATHE WORKS: 422 Madison Street, South Bend, Ind.

Here's a Money Maker on Variety Forging

The ease with which dies are changed and the positive control of hammer blows make this **Bradley Upright Helve Hammer** a most profitable piece of forging equipment in shops where variety work predominates.

Its flexibility permits it to cope with any amount of irregular work where frequent stops are necessary.



It meets the need for output, requires minimum repairs and is conservative in the use of power. Let us tell you why there are so many Bradley Hammers in the field.

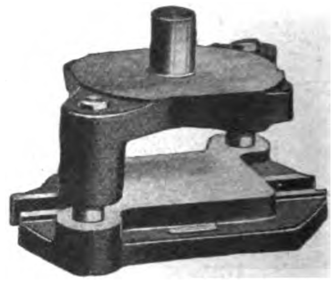
C. C. Bradley & Son, Inc.
Syracuse, N. Y.

Investigate Style-D U. S. Sub Presses

You'll find them mechanically correct in design—priced right and made of first class materials.

Made in several styles, and ready for *immediate delivery*.

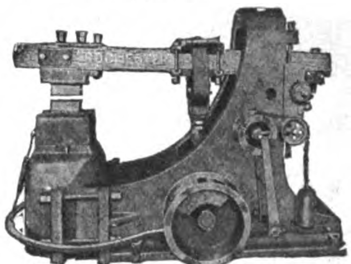
Send for Circular and note the range.



Style D

U. S. Tool Co., Inc.
117 Mechanic St., Newark, N. J.

Prospects for Profits



The Rochester Helve Hammer

Prospects become Realities when efficient labor saving tools, like the Rochester Helve Hammer are installed. Furnished with 25 lb. to 100 lb. heads. Up to your Standard of Results — Satisfaction.

THE WEST TIRE SETTER CO.
Rochester, N. Y.

THE LONG AND ALLSTATTER CO.

POWER PUNCHING & SHEARING MACHINERY

AMERICAN PUNCH & SHEAR WORKS — THE QUALITY LINE

HAMILTON, OHIO, U.S.A.

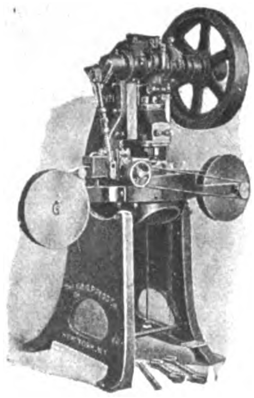
Foreign Representatives: Allied Machinery Co. of America, 51 Chambers Street, New York, N. Y.

Automatic Feed Punch Presses

V & O Presses with automatic feed attachment will stamp out your small metal blanks at a rapid rate. They greatly reduce cost and labor.

The stock and scrap rolls are made integral with the press. No wasted, cluttered up floor space.

Write for Bulletin A-6



The V & O Press Co.
Glendale, Brooklyn, N. Y.

D and M

Guards for Punch Presses
Save Fingers and Dollars

Let Us Tell You About Them.

TAYLOR-SHANTZ CO.
484 St. Paul St., Rochester, N. Y.

PRESSES and SHEARS

Sheet Metal Working Machinery

THE D. H. STOLL CO., Inc.
Military Road & Lansing St., Buffalo, N. Y.

NAZEL ENGINEERING & MACHINE WORKS

Built in three types, six sizes, with capacities up to 7 in. square.

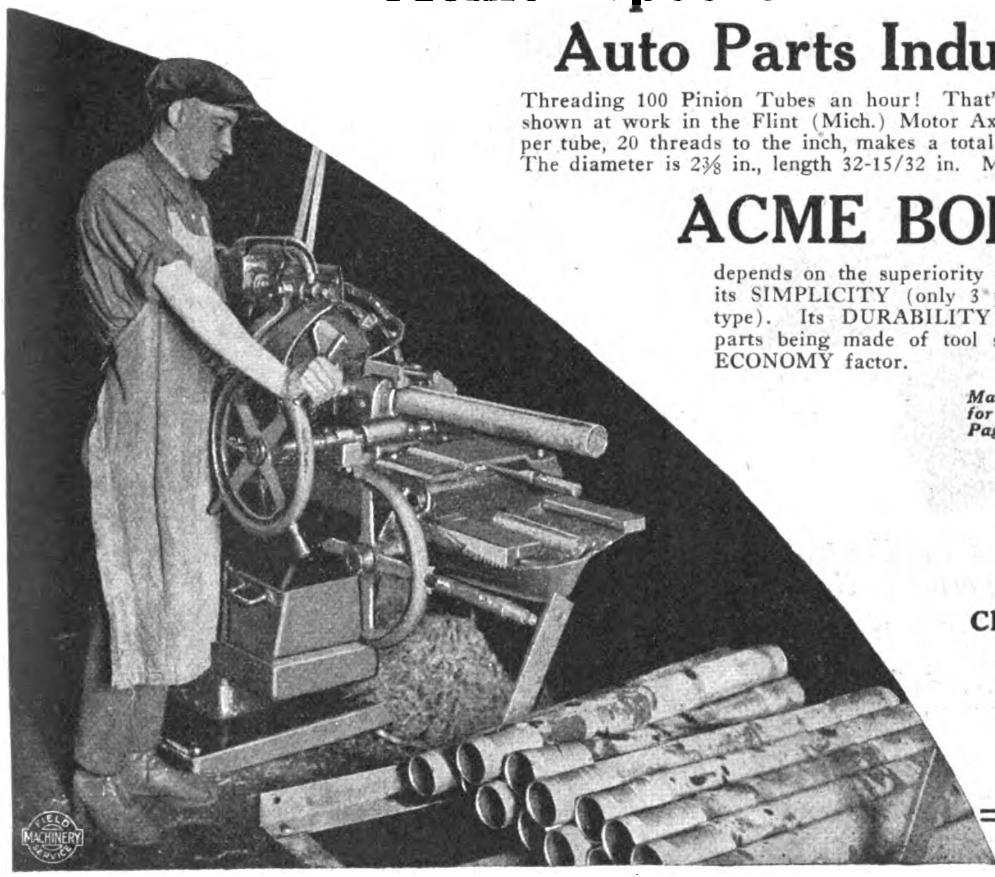
Manufacturers of Forging Hammers for Belt or Motor Drive

4041-4051 N. 5th St.
Philadelphia, Pa.

Write for the Nazel Hammer Book

Noted for their blow and control

"Acme" speeds Production in the Auto Parts Industry



Threading 100 Pinion Tubes an hour! That's the daily routine of the ACME shown at work in the Flint (Mich.) Motor Axle Co. plant. One inch of threads per tube, 20 threads to the inch, makes a total of 2000 threads every 60 minutes. The diameter is 2⅜ in., length 32-15/32 in. Much of the success of the

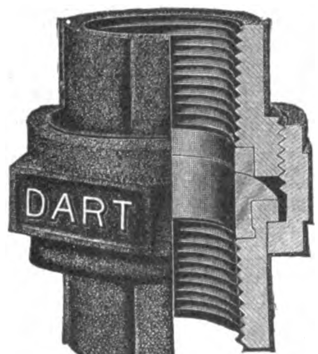
ACME BOLT CUTTER

depends on the superiority of the **Acme Die Head**, noted for its SIMPLICITY (only 3 parts to old type, 2 parts to new type). Its DURABILITY is well established—all wearing parts being made of tool steel. Cheapness of dies is a big ECONOMY factor.

Made in single to quadruple head types for ¼ in. to 6 in. work. Get our 220 Page Catalog, describing our full line.

THE ACME MACHINERY COMPANY
CLEVELAND, OHIO, U.S.A.

FOREIGN AGENTS:
Burton, Griffiths & Co., Ludgate Square Ludgate Hill, London, England; Glaenzer & Perreaud, 18 Faubourg du Temple, Paris, France. Henry W. Peabody & Co., Melbourne, Australia. Ing. Ercole Vaghi, Corso Porta Nuova 34, Milan, Italy.



Perfectly Tight Under High Pressure

Dart non-corrosive bronze seats accurately ground together make Dart Unions non-leaking.

A free sample on request

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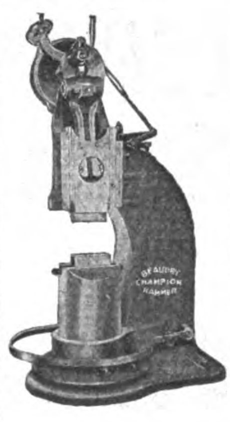
E. M. Dart Mfg. Co.
Providence, R. I.
The Fairbanks Co., Sales Agents
Canadian Factory—
Dart Union Co., Ltd., Toronto



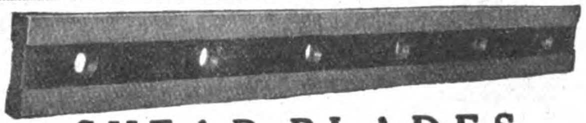
BEAUDRY HAMMERS

Double your capacity and halve your costs. Perfectly controlled. 50 to 500 lb. sizes.

Belt or Motor Drive.

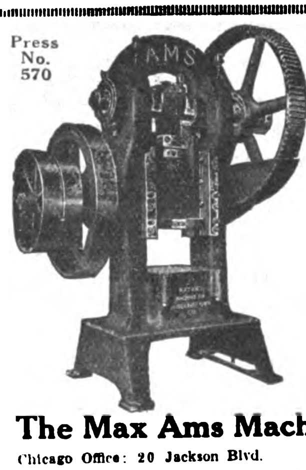
Send for Catalog

Beaudry & Company, Inc.
Boston, Mass.



SHEAR BLADES

THE CLEVELAND KNIFE & FORGE CO.
CLEVELAND, OHIO



Press No. 570

PRESSES

Large or small
Regular or Special
The last word in Presses is

"AMS"

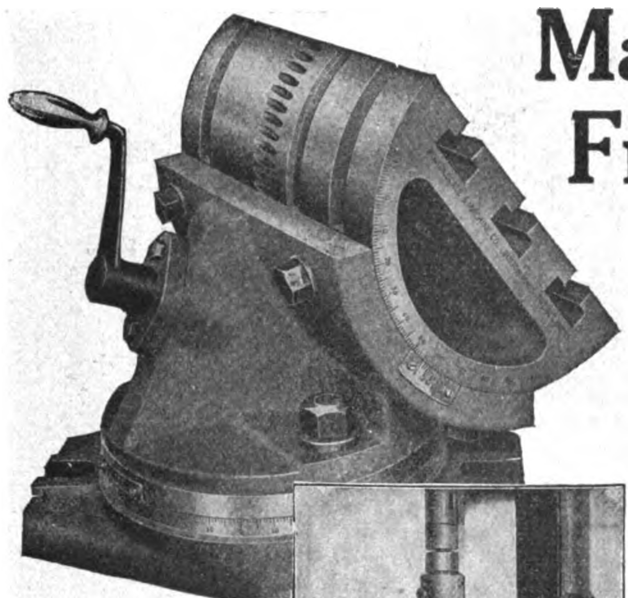
Look for it.
It's your security.

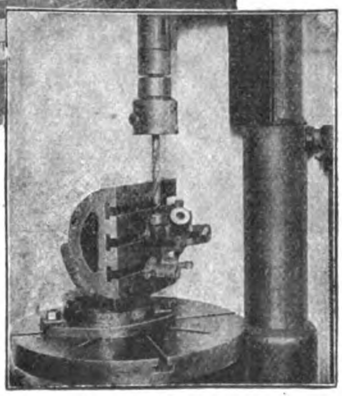
The Max Ams Machine Co. 101 Park Avenue New York City, N. Y.
Chicago Office: 20 Jackson Blvd. Rochester Office: 705 Commerce Bldg.

ATLAS Presses

There is nothing to offset the saving when you invest in an Atlas Press. You get two presses for the cost of one when you install Atlas Presses. *Write for the Atlas Bulletins.*

Atlas Press Co., 317 N. Park St. Kalamazoo, Mich., U. S. A.





Making More Profit From Every Angle

Time wasted on set-ups for machining irregular shaped pieces penalizes profit. More than this, you cannot be certain of obtaining the correct angles on blocked up jobs.

The **Universal Angle Plate** takes all guesswork and waste out of set-ups.

It has a horizontal motion through 360 degrees and a vertical motion of 90 degrees.

It is ruggedly built, and has unlimited possibilities of application for work on lathes, planers, milling machines, shapers, drill presses and grinders.

When you turn the handle of the **Universal Angle Plate,** you turn more profit out of every job. Let us show you.

Universal Angle Plate

Boston Scale & Machine Co.

100 Ruggles St., Boston, Mass.

Agents for Great Britain, Belgium, Italy, India, Japan, Formosa and Korea.
Alfred Herbert, Ltd., Coventry, England

BUY NOW!

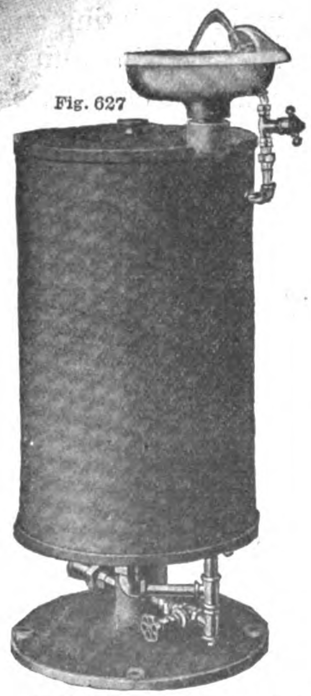


Fig. 627

All Prices Reduced

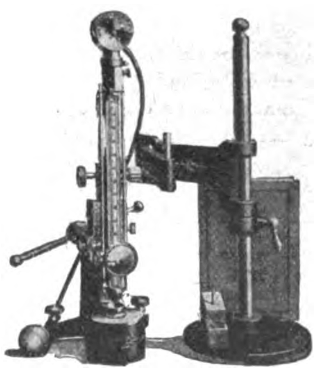
We have gone over our entire line and reduced the prices on everything. This is a great opportunity to buy our metal equipment for shop, factory and office at rock-bottom prices.

Our complete line of Factory and Institutional Equipment includes:

Sanitary Wash Bowls (in batteries). Bubbling Fountains (plain and ice cooled). Metal Lockers, Metal Stock and Pattern Racks, Metal Shelving, Metal Cabinets. Vaults Fixtures, Soda Kettles (40 and 60 gallon). Metal Stools and Chairs, Water Heaters and Mixers, Work Benches, Bench Legs, Drawing Stands. Metal Toilet Partitions, etc.

Send for Revised Price List.

Manufacturing Equipment & Engineering Co.
Framingham, Massachusetts



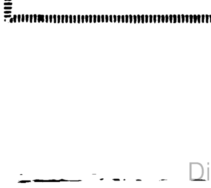
International Standard Scleroscope (Hardness Tester)

The Shore Scleroscope

is now used in hundreds of plants for its accuracy in hardness testing. It is direct reading and can readily be operated by anyone. Ranges from softest metals to hardest steels without adjustment. It is invaluable in ordering materials to specifications. The free booklet will interest you.

The Shore Instrument & Mfg. Company
Van Wyck Ave. and Carrl St.
Jamaica, N. Y.

Randall & Stickney Indicators and Gauges



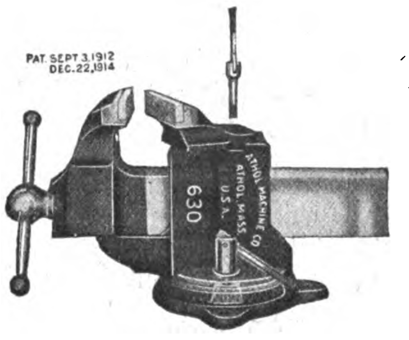
for every kind of precision measurements on duplicate parts. Quickly and easily applied. Unsurpassed in simplicity and durability.

Calibrated in thousandths of an inch or metric scale. Ideal for the rapid, accurate inspection of large quantities of work. No modern shop should be without them.

Write us today.

Randall & Stickney
Waltham, Mass., U. S. A.

You can't strain nor spring it



WHEN we designed this Athol Swivel Base and Swivel Jaw Vise we considered fully the abuse that such equipment is frequently given.

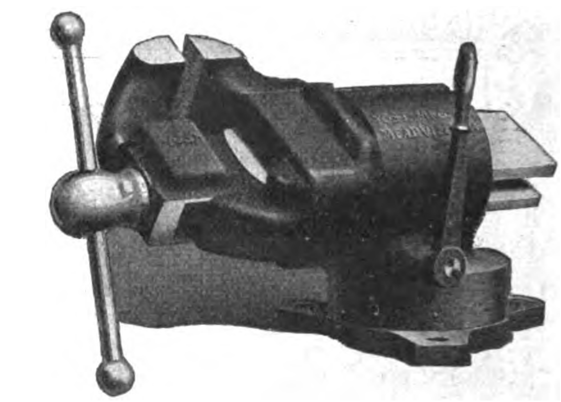
The jaw and base locks are positive and will hold under strains that will pull the vise from the bench.

This is a mighty desirable type of vise for all-around bench use and readily accommodates itself to a wide variety of work.

Send for Catalog No. 35 and note the full line of

ATHOL-STARRETT Vises

Athol Machine & Foundry Co.
Athol, Mass.



The Yost Takes the Stretch Out of Vise Work

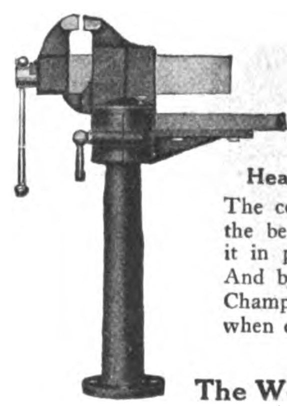
The stiff, non-swiveling vise of yesterday **was not** conducive to quality nor quantity output.

The bench man had to stretch and strain to reach the surfaces requiring finish.

When you set-up a piece of work in a **Yost Vise,** you can locate it in the most convenient working position. And there is no "give" nor spring to a "Yost."

Let us show you some of the type we manufacture

Yost Manufacturing Co.
Meadville, Pa., U. S. A.



Easily Attached

No mutilation of the bench is necessary in attaching

The Champion

Heavy Adjustable Bench Vise

The collar support abuts the edge of the bench while the lag screws hold it in place.

And by this method of support "The Champion" cannot jump or rattle when chiseling or hammering is done.

Ask for complete catalog.

The Western Tool & Mfg. Co.
Springfield, Ohio, U. S. A.

KNURL HOLDER

Two Sizes

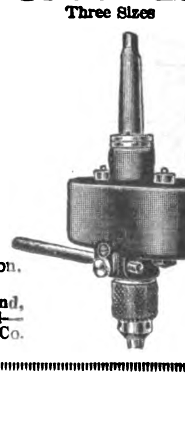
For Turret Machines

Adjustable to knurl all work up to 2½-in. diameter.

High Speed Drilling Attachment or

DRILL SPEEDER

Three Sizes



DRILL VISE

Three Sizes
With and Without Jig Attachments

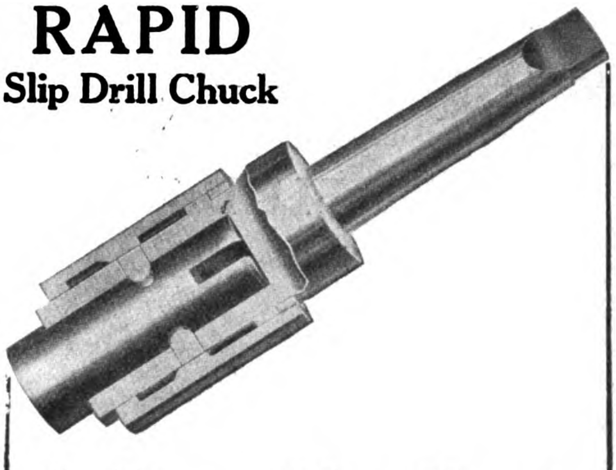
Often used on miller, shaper or planer.

Send for circulars.

Great Britain — Burton, Griffiths & Co.
France, Italy, Switzerland, Spain and Holland— Fenwick Freres & Co.

The Graham Mfg. Co.
Providence, R. I.

RAPID
Slip Drill Chuck



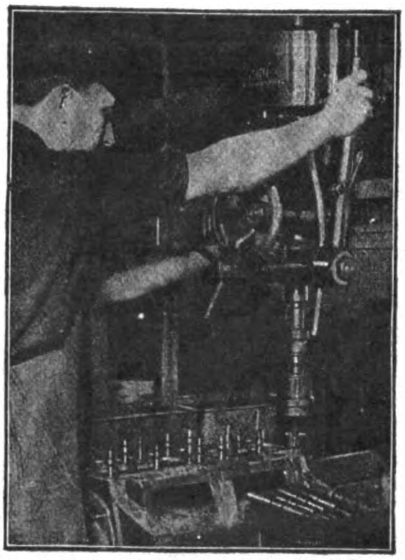
A Bang-Up Chuck Every Shop Needs

It is a chuck which will stand heavy service without injury to the collet. Note the large amount of driving surface between the collet and the holder. This means rigidity and straight, true driving.

Investigate its advantages.

American Equipment Co.
DETROIT

ERRINGTON



Quick-Change Drilling, Tapping, Studding Chuck

Style E. P.

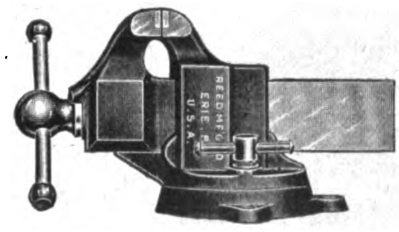
This automobile crank case has 24 holes tapped and studded.

5 holes 3/8" x 16"; 12 holes 1/2" x 13"; 6 holes 1/4" x 20" and 1—1/8" hole for pipe tap.

These holes are tapped in 4 *minutes;* and the 24 studs are set in 3 *minutes,* with a total of 64 crank cases handled per each nine-hour day.

Errington Mechanical Laboratory
Broadway and John St., New York City

Machinery Hall, 549 W. Washington Blvd., Chicago, Ill. — 831 Old South Bldg., Boston, Mass.

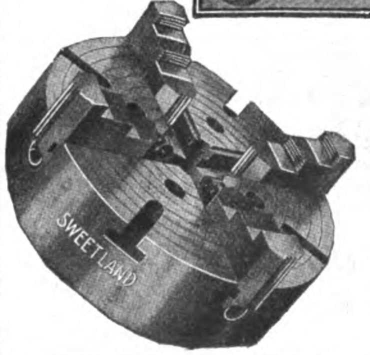


Works Easy

That's because Reed Vises are correctly designed and carefully made. The snug but easy working fit of parts also contributes to greater rigidity—valuable feature in a vise.

REED MANUFACTURING CO., Erie, Pa.

SWEETLAND CHUCKS



are recognized as highly efficient turning equipment. In design they are always a few steps ahead of machining requirements.

Let us show you our line.

The Hoggson & Pettis Mfg. Co.
New Haven, Conn.

Almond PRODUCTS

Geared Drill Chucks	Right Angle Transmission
Standard Drill Chucks	Flexible Steel Tubing
Independent Lathe Chucks	Flexible Arms
Geared Scroll Lathe Chucks	Micrometers
Combination Lathe Chucks	Fine Mechanical Tools

Illustrative Descriptive Bulletins Mailed upon Request

T. R. *Almond* Mfg. Co., Ashburnham Mass.

CHUCK WITH AIR

The Lavoie Air Chucks are very simple in construction and are easy to operate. The grip is absolutely certain, as is the release. Made in seven types with six styles of jaws.

Write for particulars.

FRONTIER CHUCK & TOOL COMPANY
34 Letchworth St., Buffalo, N. Y.

1876 TRUMP DRILL CHUCK 1922

HIGH QUALITY—LOW PRICE

Three Sizes: 1/8-in., 1/4-in., 3/8-in. Descriptive lists on application.

Trump Bros. Machine Co., Mfrs.

Wilmington, Delaware
Chas. Churchill & Co., London, Eng.

Keep Your Plant Clean

—not only with the broom, but by proper storage of those materials which accumulate around the shop, and give it a lack-of-system look. Send for circular of Brown Sectional Stock Racks. It shows you how.

Brown Engineering Co.
115 N. Third St., Reading, Pa.

How can you Compete Without DEPENDABLE Drills?

Trying to produce good work at competing prices while using unreliable tools, is like building a Woolworth Building on sand!

Why take chances with so-called "cheap" drills and reamers, when hole-making is such a big factor in final costs? Why not *standardize* on the drills you can be SURE about—12 good drills in every dozen!

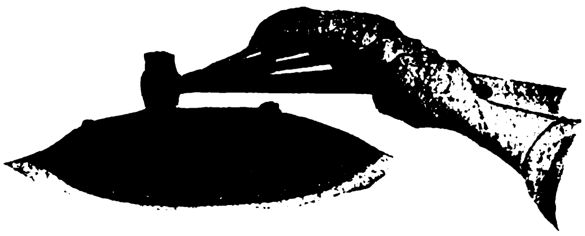
This "BUCKEYE" dependability was not built up over night. It represents years of experience, thousands spent in research—and a constant effort to keep the name "BUCKEYE" as the apex of achievement in drill making. Every step, from analysis of raw material to finishing, tempering, inspecting, and service—represents more thoroughness and efficiency than you have ever thought possible!

The sensible plan is to put a BUCKEYE drill to the test. Write today.

TOOLS OF PROVEN MERIT

The Buckeye Twist Drill Co.
ALLIANCE, OHIO
Chicago Office: 26 South Jefferson St.

Don't Waste Time Turning Nuts with an Old-Fashioned Wrench



Use a

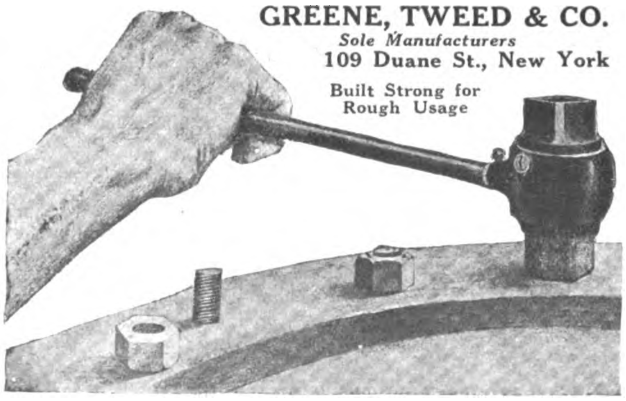
FAVORITE REVERSIBLE RATCHET WRENCH

which is a time-saver because its movement is quick and positive, cutting out all the lost motion of the old-fashioned wrench.

Cannot slip off the nut and bark the knuckles.

GREENE, TWEED & CO.
Sole Manufacturers
109 Duane St., New York

Built Strong for Rough Usage



Better Quality and Lower Threading Costs

Revolutionized Threading

THESE are the factors that will count in manufacturing in the highly competitive markets of 1922. Threaded parts must be accurately made at lowest costs; shutdowns and troubles eliminated.

This means H & G Self-Opening Die Heads! They will handle work with speed, facility and no troublesome rejections. These heads on your equipment will bring it right up-to-date. The three principal styles are adaptable to practically all machines on which threading is done.

Send for 96-page Catalog and Price List. Die Heads for tests in your own shop on your own work gladly furnished. This is the practical way to buy. You make a decision on a basis of actual facts—results.

H & G WORKS

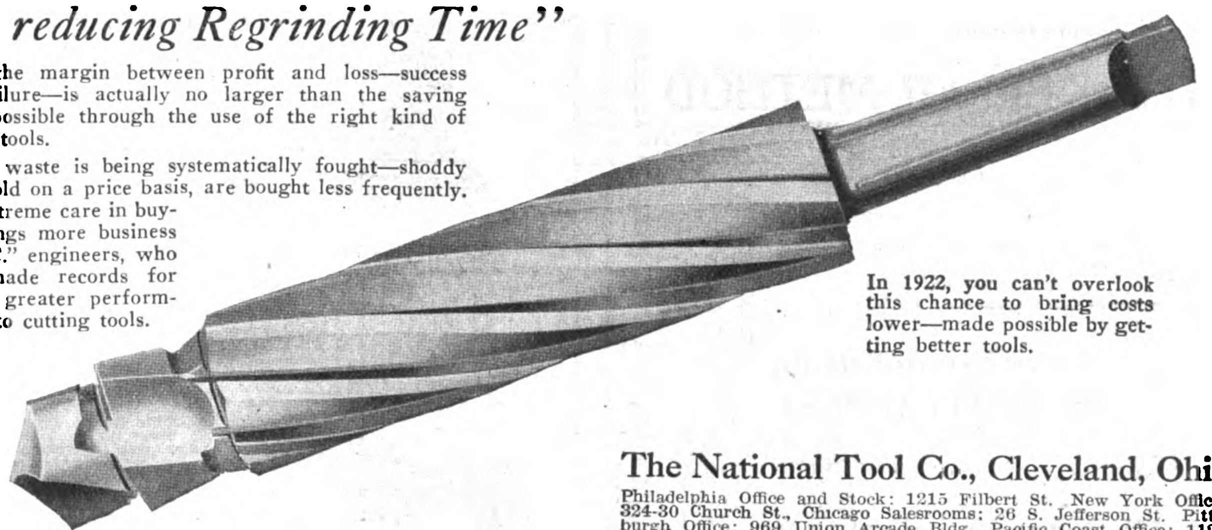
The Eastern Machine Screw Corporation
20-40 Barclay St., New Haven, Conn.
Single and Double Spindle Threading Machines, Chaser Grinders, Screw Machine Products
Foreign Representatives: Goodchild & Partners, Ltd., London, England
Societe Des Usines Curial, Paris, France.

The Tool Decides It

"Paid for themselves quickly by reducing Regrinding Time"

Often the margin between profit and loss—success **and fail**ure—is actually no larger than the saving **that's pos**sible through the use of the right kind of **cutting t**ools.

Today, waste is being systematically fought—shoddy **tools, sold** on a price basis, are bought less frequently. **This extr**eme care in buying **brin**gs more business to "N.C." engineers, who **have m**ade records for **putting** greater performance **into** cutting tools.

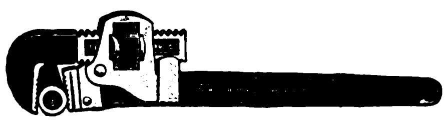


In 1922, you can't overlook this chance to bring costs lower—made possible by getting better tools.

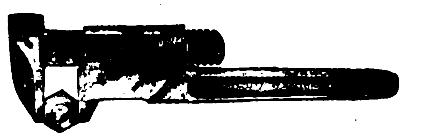
The National Tool Co., Cleveland, Ohio

Philadelphia Office and Stock: 1215 Filbert St. New York Office: 324-30 Church St., Chicago Salesrooms: 26 S. Jefferson St. Pittsburgh Office: 969 Union Arcade Bldg. Pacific Coast Office: 1125 Gasco Bldg., Portland, Ore. Atlanta Office: 34 S. Forsythe St. Detroit Office and Stock: 610-611 Sun Building. European Office: 139 Queen Victoria St., London, England.

NATIONAL-CLEVELAND



The Trimo Pipe Wrench
Made with Wood Handles in 6-in., 8-in., 10-in. and 14-in. Sizes; with Steel Handles in All Sizes



Trimo Nut Wrench
6-in., 8-in., 10-in., 12-in., 15-in., 18-in. and 21-in. Sizes.
Especially Suitable for Railroads

TRIMO

The Word Trimo

stands for good tools made by the Trimont Mfg. Co., which are the following:

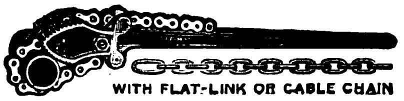
The Trimo Pipe Wrench
The Trimo Chain Pipe Wrench
The Trimo Monkey Wrench
The Trimo Pipe Cutter (Hand)

The Four Good Points

that make the ***Trimo Pipe Wrench*** superior are the ***Spiral Spring*** always in place—***Steel Frames*** that will not break—***Nut Guards*** that protect adjustment nut—and the ***Inserted Jaw in handle*** that can be replaced when worn. ***Save money*** and buy Trimo goods, made by

Trimont Manufacturing Company

Roxbury, Mass., U. S. A.



Trimo Chain Wrench
In 8 Sizes, takes pipe from ⅛-in. to 16-in.

Trimo Pipe Cutter in 3 Sizes
No. 1 Cuts ⅛ to 1¼-in. Pipe.
No. 2 Cuts ¼ to 2-in. Pipe.
No. 3 Cuts 1 to 3-in. Pipe

No Chatter. Reams Smooth Holes

Made of the highest grade of steel, the Kruce Spiral Expansion Reamer is an improved tool for a wide range of uses throughout every machine shop.

It reams a perfectly smooth hole in key-seated or oil grooved parts without chatter

Write to us for quantity discounts. State fully your requirements.

Special reamers to sketches or instructions

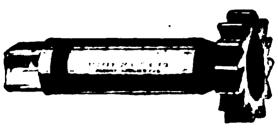
Pat. Applied For

E. J. KRUCE & COMPANY
960 Harper Ave., Detroit, Mich.

KRUCE
Spiral Expansion Reamer

Scully-Jones Woodruff Cutters

Drives by the square and centers by the shank.



An all-high-speed-steel Woodruff Cutter. Nothing forced in—nothing taken out.

This is the toughest, the strongest the most carefully-made Woodruff Cutter on the market, to our knowledge.

Provided with squared shank which facilitates quick, rigid chucking in our "WearEver" Woodruff Cutter Chucks. They drive by the square and center by the shank.

Write for our Catalog No. 29. Also for prices and deliveries.

Scully-Jones & Co.
649 Railway Exchange Bldg.
Chicago

Williams' Superior Drop-Forged Clamps

11 *Patterns, in a wide range of sizes, for every clamping purpose.*

DROP-FORGINGS
often cheaper than castings
—always far superior—

J. H. WILLIAMS & CO.
"The Drop-Forging People"

BROOKLYN 35 Richards St.
BUFFALO 35 Vulcan St.
CHICAGO 1035 W. 120th St.

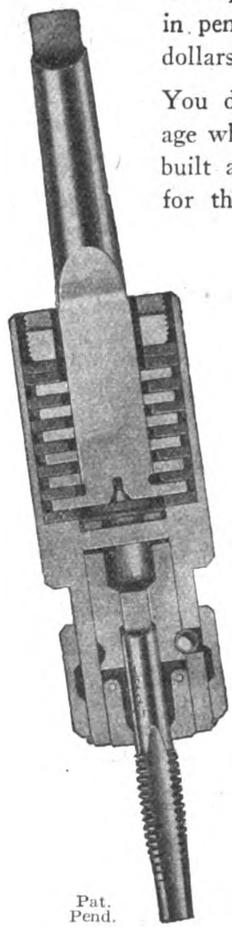
W&B

The Whitman & Barnes Mfg. Co.
TWIST DRILLS & REAMERS
AKRON, OHIO, U.S.A. NEW YORK LONDON

A Tap is a Tap—
Why Squander Good Taps in Poor Holders?

"Spare the holder and spoil the tap" is a poor maxim—when it results in penny-saving on tap holders and dollars wasted on tap breakage.

You don't risk excessive tap breakage when you drive taps in a holder built as this cross-section indicates—for the



Pat. Pend.

APEX
Safety Tap Holder

knows exactly when to slip. Note the big area of friction surface—did you ever see a tap with more positive grip? For holes in tough metal and blind holes you can drive to the limit. Don't worry about the scrap-pile.

30-days' trial offer.

You can't afford to pass up this opportunity when our 30 days' free trial offer enables you to check up our claims without cost on your part. WRITE TODAY!

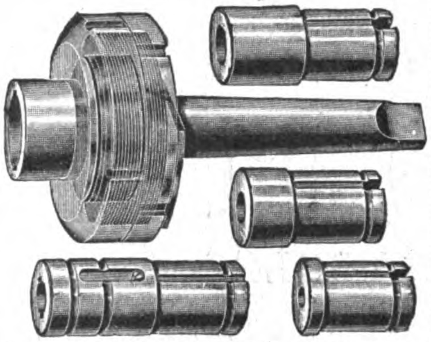
APEX Screwless UNIVERSAL JOINT

is an ideal partner to the APEX Tap Holder—noted for its freedom from trouble, and its power saving. It operates successfully at any angle up to 35°. Designed to replace broken joints on all multiple spindle drills. GUARANTEED TO FIT ALL MAKES. The 30-Day trial offer holds good here also. WRITE TODAY.

Pat.

The Apex Machine Co.
Dayton, Ohio
Manufacturers of Safety Tap Holders and Universal Joints
Representatives—Detroit, The American Equipment Co.

The Safety Drill and Tap Holder



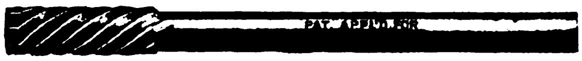
is the only attachment for the purpose that gives universal satisfaction and is Unequaled for Efficiency, Convenience, Rapidity, Accuracy and Simplicity.

Can be furnished with special sockets with friction set to carry one or two sizes of taps, useful if sizes are constantly changing.

Nothing to *break* or get out of *order*. Made in 4 sizes covering from 0 to 2½ in. diameter.

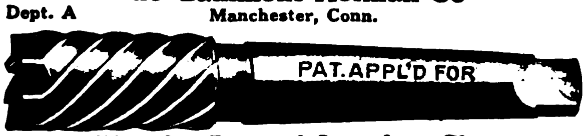
The Beaman & Smith Co., Providence, R. I., U. S. A.
Builders of Boring and Milling Machines, and Special Machines for such Purposes Constructed.

THE GAMMONS HELICAL CHUCKING REAMER AND END MILL



They do better work and do it faster. There's a reason. Note the design. It combines a fast cutting end with a smooth cutting body. Chatter is eliminated and perfect work results. Let us tell you more about them. What size do you want price on?

The Gammons-Holman Co
Dept. A **Manchester, Conn.**



They Cut Fast and Smooth as Glass

30 days, on trial!

"DIAMOND-H" centers cost less and wear longer! On a heavy-duty job a "Diamond-H" stood up over 30 *days*. The life of an ordinary center on same job was *one day*.

Manufactured in all Standard Sizes and Tapers.

Send for sample and use it for 30 days.

Detroit Alloy Steel Co.
1436 Lafayette Blvd., Detroit, Michigan

Look for the* GTD *mark on

Screw Plates, Taps, Dies, Reamers, Gages, Pipe Tools, Twist Drills, Milling Cutters, also Plain, Internal and Universal Grinders, etc.

Greenfield Tap & Die Corporation
Greenfield, Mass.

GTD
REG. U.S. PAT. OFF.

Canadian Plant: Greenfield Tap & Die Corporation of Canada, Limited, Galt, Ontario.

TWIST DRILLS, CUTTERS, REAMERS AND SPECIAL TOOLS

NATIONAL TWIST DRILL & TOOL CO.
DETROIT, U.S.A.

NATIONAL TWIST DRILL & TOOL CO.

How Many Files Actually in a Dozen?

"Twelve," you'll probably say off hand. But check them up! If only *ten* or *eleven* can deliver the right kind of filing service—and the maximum *amount* of service—then you're *not* getting twelve *real* files per dozen!

Many tool room executives find that by selecting files stamped with the

FILES ONLY THE BEST ARE GOOD ENOUGH TOOLS
TRADE MARK

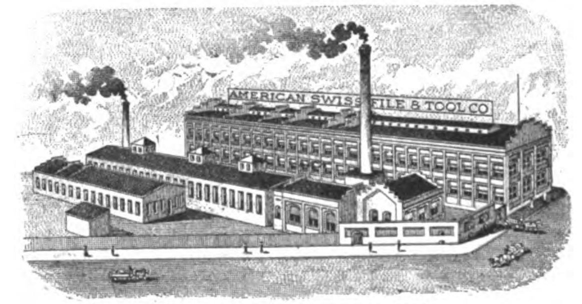
they get from each dozen many more hours of real work than from any other Files.

The moral is simple—place the emphasis on what the files can *do*. Their cost, in the long run, will be less than that of files bought to sell at a lower price. A trial will prove it.

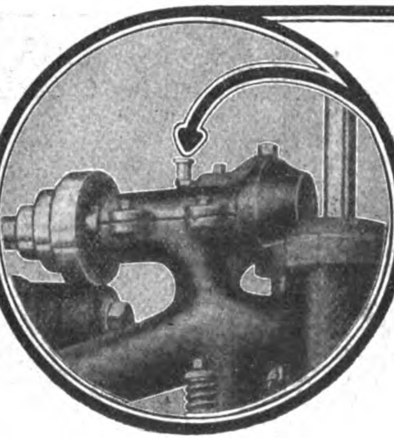
AMERICAN SWISS FILE AND TOOL CO.

ELIZABETH, N. J.

Sales Office:
E. P. Reichhelm & Co., Inc., 26 John Street, New York City



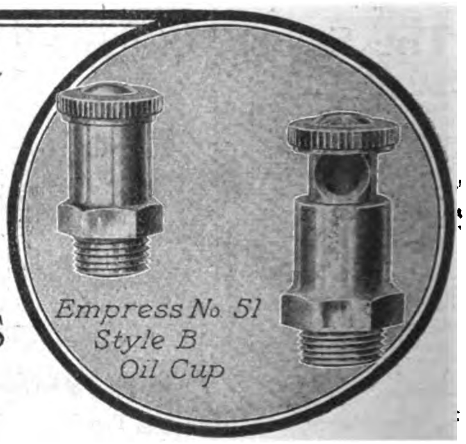
WORKS: ELIZABETHPORT, N.J.



Standard Factory Equipment on

MACHINE TOOLS

Shown here as used on the Canedy-Otto No. 36 Back Gear Drill



Empress Grease and Oil Cups

Meet every lubrication requirement of machine tool building and operation. Special design cups for special needs; a lubricator for every part.

EMPRESS No. 51 STYLE B OIL CUP

This cup is particularly well suited to several phases of machine tool lubrication; it is self-closing, cannot be left open, and is absolutely dust-proof when closed. The revolving top makes it possible to fill the cup from any direction. Its bright finish makes it so conspicuous that the operator cannot readily overlook it and fail to keep his machine well lubricated. Made in eight sizes, two finishes.

Write for Catalog H

REG. U.S. PAT OFF. Empress

Bowen Products Corporation

Manufacturing and Sales Divisions
Auburn Div., Auburn, N. Y. Winkley Div., Detroit, Mich.
Cleveland Div., Cleveland, Ohio
Minneapolis Div., Minneapolis, Minn.

Branch Sales Offices
New York, 220 Broadway. Chicago, 2110 Michigan Ave.
San Francisco, Monadnock Bldg.
Boston, 161 Massachusett Ave. Kansas City, Mo., 301 Ridge Bldg.

You Save Its Cost In Output

Economy Grinding Lubricant permits of coarser feeds at higher speeds without danger of overheating the work. It assures a greater volume of work per power unit and thus pays for itself by increasing production.

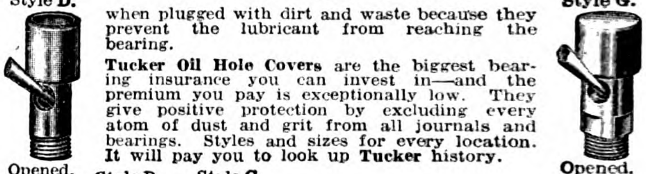
Grinding machine manufacturers recommend **Economy Grinding Lubricant** to purchasers of their machines. They have made a thorough study of grinding requirements and their advice is valuable.

Let us prove the merits of "Economy" on some of your own work.

The White & Bagley Co.

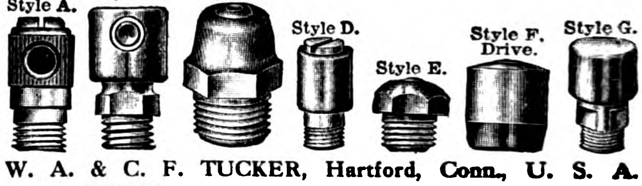
Worcester, Mass.

Oil Holes are Useless



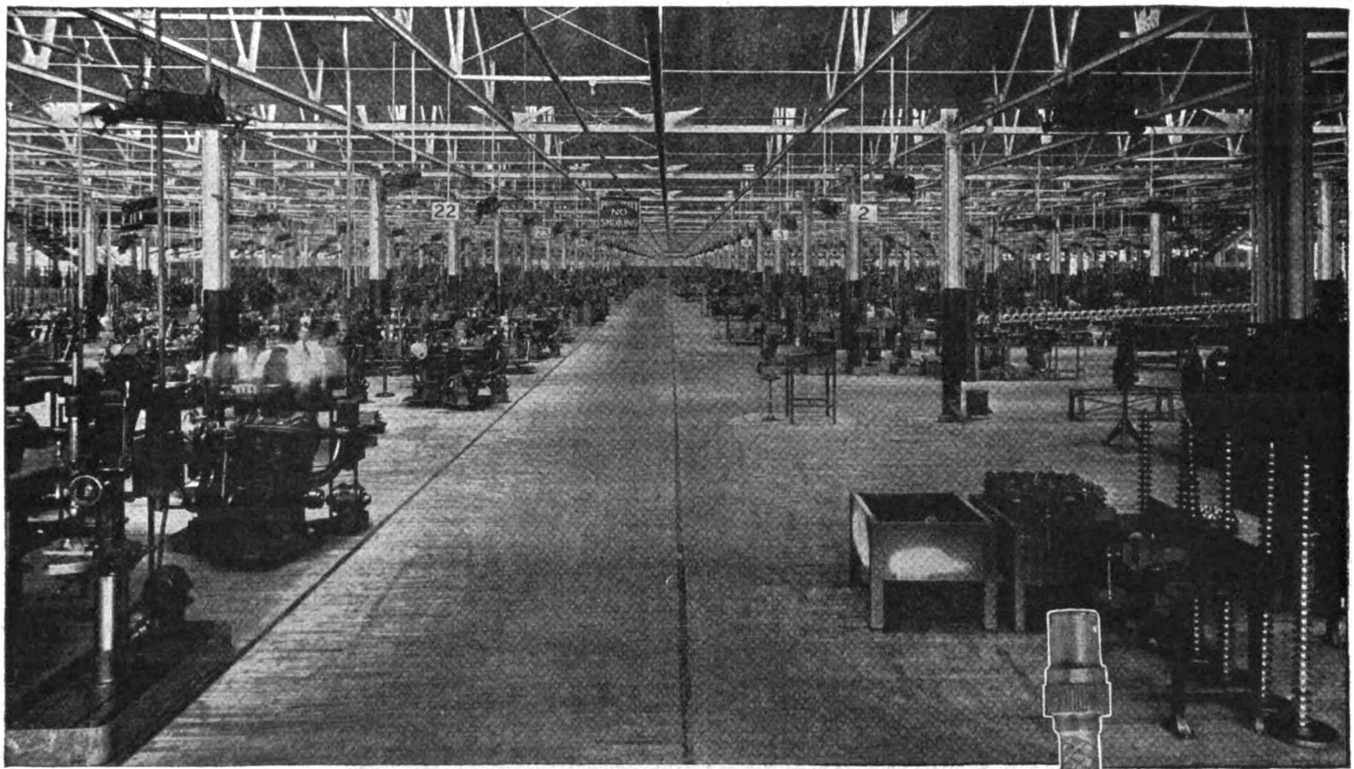
when plugged with dirt and waste because they prevent the lubricant from reaching the bearing.

Tucker Oil Hole Covers are the biggest bearing insurance you can invest in—and the premium you pay is exceptionally low. They give positive protection by excluding every atom of dust and grit from all journals and bearings. Styles and sizes for every location. It will pay you to look up **Tucker** history.

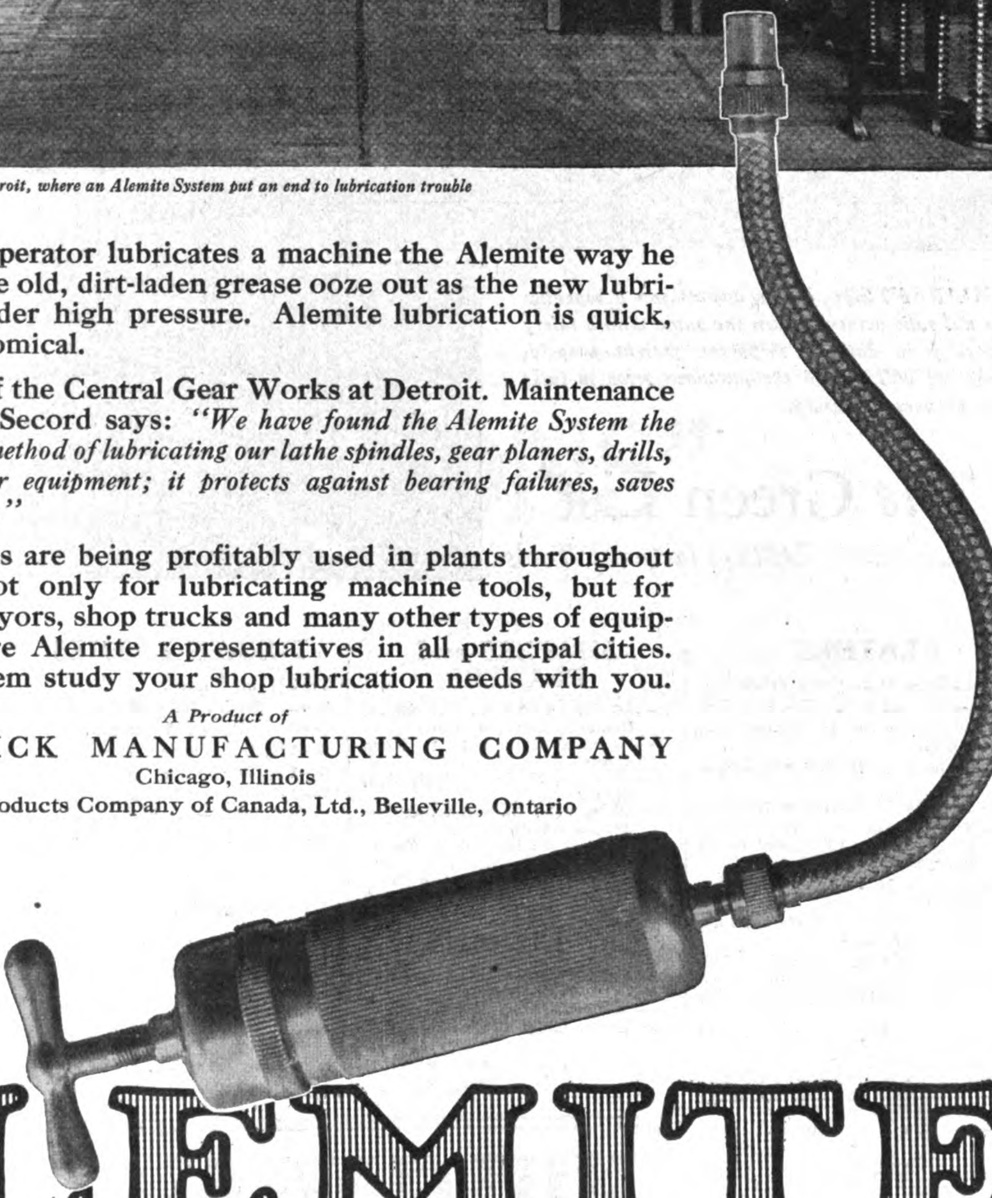


W. A. & C. F. TUCKER, Hartford, Conn., U. S. A.

FOREIGN AGENTS: Fenwick Freres & Co., Paris, France.
Alfred Herbert, Ltd., Yokohama, Japan.



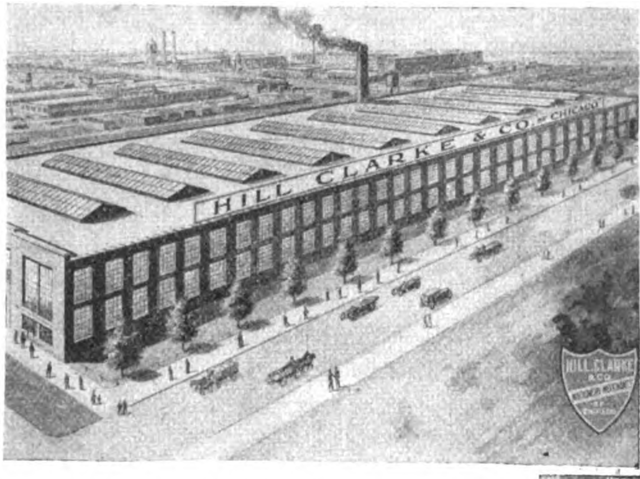
Plant of the Central Gear Company, Detroit, where an Alemite System put an end to lubrication trouble



ReMANUFACTURED -(ORIGINATED BY US)- MACHINE TOOLS

REG. U. S. PAT. OFFICE

THE Hill-Clarke guarantee backs every Re-Manufactured Machine Tool.
—but what backs that Guarantee?
We answer by pointing to our enormous plant—55,000 square feet of Re-Manufacturing space—housing a vast array of the most modern equipment. And we answer by calling attention to the fact that the Re-Manufacturing Process—originated by us—has been brought to a stage approaching perfection as a result of our unrivaled facilities and long, specialized experience. When you read The Green List bear that guarantee in mind.



GUARANTEE: If for any reason a machine is not satisfactory, return the same within thirty days from date of shipment, freight prepaid, and we will refund the purchase price in full; no excuses necessary.

The Green List*
of Guaranteed ReManufactured Tools

LATHES

1—45 in. x 24 ft. Pond Triple Gd.
3—36 in. 42 ft. Le Blond, Q.C.G.
15—36 in. x 30 ft. Pittsburgh, Q.C.G.
1—36 in. x 19 ft. Johnson Triple Gd.
6—30 in. x 11 American Gd. Hd.
15—Each 26 in. x 9 ft., 10 ft., 12 ft., 16 ft., 18 ft. and 20 ft. Bridgeport, Q.C.G.
3—20 in. x 10 ft. Lodge & Shipley, Q.C.G.
89—20 in. x 8 ft., 12 ft. x 16 ft. American, Q. C. G.
13—20 in. x 8 ft. LeBlond, Q.C.G.
20—19 in. x 8 ft. Le Blond, Q.C.G.
20—18 in. x 8 ft. Boye & Emmes, Q.C.G.
8—17 in. x 6 ft. Le Blond Mfg. Auto.
6—16 in. x 6 ft. Reed.
1—15 in. x 6 ft. Sidney, Q.C.G.
2—14 in. x 6 ft. Carroll-Jamieson, Q.C.G.
1—13 in. x 5 ft. Willard.

DRILLS

1—Each 3 ft., 3½ ft., 4 ft. and 6 ft. Western Radials.
15—6-Spindle Allen Ball Bearing.
3—4-Spindle Allen Ball Bearing.
3—3-Spindle Allen Ball Bearing.
1—2-Spindle Henry & Wright.
3—No. 11 Pratt & Whitney Multiple.
2—8-Spindle Natco Multiple.

SHAPERS and PLANERS

1—96 in. x 72 in. x 20 ft. Bement, Miles, 4 heads.
1—72 in. x 72 in. x 14 ft. Niles, 4 hds..
1—40 in. x 30 in. x 6 ft. Gray Planer.
1—38 in. x 30 in. x 8 ft. Cincinnati, 2 heads.
1—34 in. x 26 in. x 8 ft. American Planer.
2—Each 16 in., 20 in. and 24 in. Walcott Back Geared Crank.

BORING MILLS

1—No. 3-A Universal Horizontal
1—10 ft. Niles Vertical.
1—34 in. Colburn Vertical.
1—30 in. Gisholt Vertical.

TURRET LATHES

1—3¼ in. Foster.
2—3 x 36 in. Jones & Lamson.
1—2 in. Brown & Sharpe.
3—1½ in. Warner & Swasey.
5—1¼ in. Foster No. 3.
5—1 in. Foster No. 2.
8—1 in. Warner & Swasey.
8—⅝ in. Pratt & Whitney.

GRINDERS

2—No. 70 Heald Internal Grinders.
2—14 in. Pratt & Whitney Surface.
2—No. 2 Brown & Sharpe Surface
1—20 in. x 96 ft. Landis Plain.

2—12 in. x 36 in. Modern Plain.
4—6 in. x 32 in. Norton Plain.
3—4 in. x 20 in. Morse Plain.
1—No. 3 Oesterlein Universal Cutter.
1—No. 2 Oesterlein Universal Cutter.

MILLERS

1—No. 4 Le Blond Plain.
2—No. 4 Cincinnati Plain.
1—No. 3 Brown & Sharpe Plain.
2—No. 2 Kearney & Trecker Plain.
1—No. 2½ Rockford Universal.
1—No. 2 Rockford Plain.
1—No. 2 Cincinnati Plain.
1—No. 2 Ohio Plain.
1—No. 20 Ohio Plain.
1—No. 0 Brown & Sharpe Plain.
50—No. 6 Whitney Hand.

MISCELLANEOUS

1—⅜-½ in. Cleveland Automatic.
1—No. 27 Bliss Press.
14—No. 1 Adams Farwell Gear Hobber.
1—30 in Flather Gear Cutter.
2—No. 3 La Pointe Double Broaches.
5—Schuchardt & Schutte Gear Hobbers.
7—No 2 Loshbough & Jordan Incl. Press.

**This is only a small part of the Green List. If the tools you want are not listed here, write.*

HILL, CLARKE & CO. OF CHICAGO
649 Washington Boulevard

SECOND-HAND MACHINE TOOLS

DRILLS

2—sp. Avey, ball bearing.
2—sp. Henry & Wright, ball bearing.
3—sp. Taylor & Fenn, plain bearing.
4—sp. Francis Reed, plain bearing.
21-in. Cinti. Bick. sta. hd., BG., PF.
23-in. Rockford sl. hd., BG., PF.
25-in. Snyder sl. hd., BG., PF., tapping att.
28-in. Sibley sl. hd., BG., PF.
32-in. Cinti. Bick. H.S. shaft drive, speed box, tapping att.
42-in. Cinti. Bick. sl. hd., BG., PF., tapping att.
No. 12 Natco multiple sp. tapping att.
No. 13 Natco multiple sp. tapping att.
No. 14 Natco multiple sp. tapping att.
No. 30 Bausch multiple sp. tapping att.
3-ft. Cinti. Bick. pl. radial, tapping att.
4-ft. Cinti. Bick. pl. radial, tapping att.
Baker Bros. & Colburn Manufacturing Type Drills.
No. 17½ Foote Burt, 4-sp.; ind. feed drill.

LATHES

No. 5 Rivett precision slide rest.
14-in. x 6-ft. Prentice Br. CR., PCF., QCG.
16-in. x 7-ft Chard, CR., PCF., semi QC.
16-in. x 8-ft. Lodge & Shipley geared hd. CR., PCF., taper att., longitudinal and cross feed stops.
17-in. x 8-ft. Le Blond CR., PCF., QCG.
17-in. x 8-ft. Flather CR., PFC., QCG.
18-in. x 8-ft. Lodge & Shipley, tool room, geared hd., M.D. taper att.
26-in. x 12-ft. Putnam CR., PCF.
32-in. x 14-ft. Boye & Emmes CR., PCF.
32-in. x 14-ft. Hamilton, CR., PCF., triple geared.
38-in. x 20-ft. New Haven CR., PCF.
36-in. x 16-ft. Pond CR., PCF., triple geared, arr. M.D.

BORING MACHINES

3 in. dia. bar, Lucas hor., table type.
4 in. dia. bar, Detrick & Harvey, hor., floor type.
24 in. Colburn turret head, vertical.
38 in. Niles, 2 reg. heads.
110-in. Betts, 2 reg. hds.

SCREW MACHINES AND TURRET LATHES

⅜-in. cap. Brown & Sharpe, wire feed.
1-in. cap. Acme, wire feed.
1¼-in. cap. Acme, wire feed.
1½-in. cap. Acme, wire feed.
16-in. x 18-in. Acme univ. fox type.
No. 3 Acme univ. 3½-in. cap. flat turret.
2¼-in. x 24-in. Jones & Lamson, bar or chucking.
3¼-in. x 36-in. Jones & Lamson, bar or chucking.

MILLERS

Nos. 2, 3 and 4 Cincinnati, plain.
Nos. 2-A and 5, and 9 Kempsmith, plain
Nos. 3 and 4 Cincinnati, vertical.
Nos. 2A, C2, 4B and 5 Becker Vert.
ACS Becker Continuous Milling Mach.
No. 2 Brown & Sharpe, universal.
No. 6 Whitney Hand Miller.
36 in. x 10 ft. Newton Face Slab Miller.

GRINDERS

3-in. x 18-in. Norton plain.
6-in. x 32-in. Norton plain.
10-in. x 36-in. Norton plain.
18-in. x 96-in. Norton plain.
10 in. x 30 in. Landis, plain.
12 in. x 120 in. Landis, plain.
12-in. x 36-in. and 48-in. Cincinnati.
No. 2 Cincinnati, 12 in. x 36 in., universal.
No. 1 Cincinnati Cutter and Reamer Grinder.
No. 1 LeBlond Cutter and Reamer Grinder.
No. 70 and No. 75 Heald Internal Grinders.
No. 6 Rivett Internal.
No. 60 Heald Cylinder Grinder.
No. 11 Rivett, ball race.
Saxon Face Grinder.
10-in. Garrigus Rotary, with magnetic chuck.
No. 2 Brown & Sharpe Surface Grinder.
No. 16 Blanchard Grinder.
18-in. and 20-in. Disc Grinders.

SHAPERS AND PLANERS

14-in. Springfield Crank Shaper.
16-in. Cincinnati Back-Geared Crank Shaper.
20-in. Hendey crank, back geared.
20-in. Whipp Crank, back geared.
24-in. Potter & Johnsón Crank, back geared.
24-in. Stockbridge Crank Shaper, back geared.
15 and 24-in. Hendey Friction Shapers.
24 in. x 24 in. x 6 ft. Flather Planer, one head.
24 in. x 24 in. x 8 ft. Cincinnati, one head.
26 in. x 24 in. x 7 ft. Gray Planer, one head.
30 in. x 30 in. x 8 ft. Cincinnati Standard, two heads.
36 in. x 36 in. x 8 ft. Pond Planer, two heads.
36 in. x 36 in. x 12 ft. Pond Planer, two heads.
36 in. x 30 in. x 14 ft. Cincinnati Planer, with three heads.
36 in. x 36 in. x 12 ft. Cincinnati Planer, four heads.
48 in. x 36 in. x 12 ft. Cincinnati Planer, three heads.
48 in. x 48 in. x 15 ft. Sellers Planer, three heads.
66 in. x 60 in. x 30 ft. Bement Planer, three heads.

MISCELLANEOUS

No. 00 S. & S. Hobbing Gear Cutter.
No. 000 S. & S. Hobbing Gear Cutter.
36-in. Brown & Sharpe Gear Cutter.
No. 3 Lapointe Broaching Machine.
3-in. Pratt & Whitney Centering Machine.
No. 72 Ferracute Press.
8 in. x 8 in. Bury Air Compressor.
½-in. and 1-in. Six-Spindle Acme Nut Tapper.
12 and 13-ft. Pratt & Whitney Profilers.
4-in. Baker Bros. Tapping Machine.
¾ in. x ¾ in. Single-End Punch and Shear.

We have a number of machines not mentioned in this list. Send us your inquiries.

HENRY PRENTISS & COMPANY,
149 BROADWAY, NEW YORK, N. Y.

BOSTON BUFFALO HARTFORD SYRACUSE ROCHESTER

"SIMMONS"

RARE BARGAINS AT SACRIFICE PRICES!

2—New 60 in. No. 468 Newton Rotary Planers.
1—New 48 in. x 32 ft. G. H. Bridgeford Motor Driven Lathe Taper Att.
2—New 60 in. x 29 ft. to 56 ft. G. H. Niles-Bement-Pond Motor Driven Lathes.
1—Practically New 18 in. Newton Slotter, with motor.
1—New 10-12 in. Dill Slotter, Motor Drive, $1,200.00.
1—12 ft. Bement Extra Heavy Vertical Boring and Turning Mill.
1—10 ft. Betts Vertical Boring and Turning Mill.
5—New 32 in. Cincinnati Shapers—Heavy Duty, Back Geared.
1—6 ft. Cincinnati-Bickford Gear Box Drive Plain Radial Drill.
6—New 36 in. x 34 ft. Geared Head Heavy Duty Bridgeford Lathes.
26 in. x 18 ft. to 24 ft. LeBlond Heavy Duty Lathes.
Long & Allstatter—Massillon—Hilles & Jones Punches and Shears.
Landis—Oster—Bignall & Keeler—Merrill Bolt and Pipe Cutting Machines.

WRITE FOR FURTHER DETAILS AND COMPLETE STOCK LIST

SIMMONS MACHINE CO., Albany, N. Y.

BRANCH OFFICES:
801 Singer Bldg., New York, N. Y.
86-88 Exchange St., Buffalo, N. Y.

MOREY COLUMN
Quality Dependable MACHINERY

BORING MILLS—HORIZONTAL AND VERTICAL
1—Dietrick & Harvey 4-in. bar; floor type; Hor.
1—No. 32 Giddings & Lewis; Hor.
1—No. 2 Rockford; Hor.
1—34-in. King Vertical Turret Lathe.
1—30-in. Rogers & Hemphill Vertical Turret Lathe.
1—48-in. Gisholt 2 head; S.P.D.
1—72-in. Niles, 2 head, cone drive.

RADIAL DRILLS
1—6-ft. Bickford Universal; S.P.D.
1—6-ft. Baush Plain; belt drive.
1—6-ft. Reed-Prentice Plain; S.P.D.
1—5-ft. Bickford Plain; S.P.D.
1—5-ft. N-B-P Semi-Universal; S.P.D.
1—4-ft. Reed-Prentice Plain; S.P.D.
1—4-ft. Western Plain; S.P.D.

DRILL PRESSES
4-, 5- and 6-spindle Allen H.S.
3—Moline hole-hog.
4—NEW 36-in. Snyder upright.
2—NEW No. 315 Baker.
1—NEW No. 216 Baker.

LATHES
3—18 x 8 Greaves-Klusman, 3-step cone DBG, QCG.
1—20 x 10 Hendey with relieving and taper att.
1—20 x 10 Reed-Prentice S.P.D., geared head.
3—21 x 10 LeBlond S.P.D., geared head.
1—NEW 21 x 12 South Bend Gap.
1—NEW 21 x 14 South Bend Gap.
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2—NEW 24 x 10 Ryerson; cone drive.
1—30 x 30 American, all geared head; 2 carriages.
2—NEW 30 x 30 LeBlond, geared head; triple speed motor drive.
3—36 x 36 LeBlond cone drive; triple geared.
3—42 x 32 Bridgeford heavy duty; all geared head; 2 carriages.
1—8 x 80 LoSwing; 2 carriages.

PLANERS
1—48 x 48 x 12-ft.—2-head Putnam.
6—26 x 26 x 8-ft.—2-head Putnam.
1—30 x 30 x 8-ft.—1-head Gray.
1—26 x 26 x 10-ft.—1-head Pond.

TURRET LATHES
11—2¼-in. Gridley Automatics.
12—3 x 36 Jones & Lamson; geared head.
4—2¼-in. x 26 Greenlee.
6—No. 1B Foster Universal.
1—NEW No. 2A Warner & Swasey.
9—NEW No. 1 Warner & Swasey.
2—NEW No. 4 Warner & Swasey.
7—No. 4 Foster.

MILLING MACHINES
1—NEW No. 2A Becker Vertical; rotary.
1—NEW No. 3A Becker Vertical.
1—NEW No. 4B Becker Vertical; rotary.
1—No. 2 Brown & Sharpe Vertical; S.P.D.
1—No. 1B Milwaukee Universal; S.P.D.
2—No. 2 Brown & Sharpe Universal.
1—No. 2 Rockford Universal; S.P.D.
1—No. 3B Milwaukee Plain; S.P.D.
1—No. 3 Brown & Sharpe Plain; S.P.D.
1—No. 34 Osterlein Plain; Cone Drive.
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1—24-in. S. & S. Gear Hobber.
1—6-in. Gleason Bevel Gear Generator.
1—No. 3 Ryerson H.S. Friction Saw.
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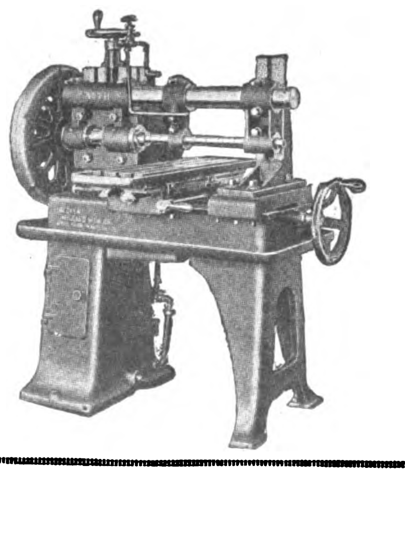

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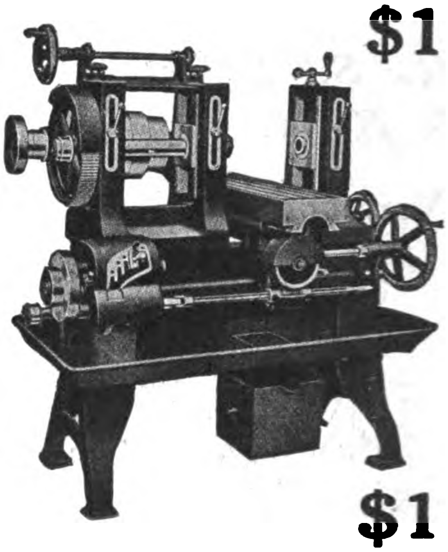

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17-in. x 8-ft., Sidney, Q.C., Used.
19-in. x 8-ft., LeBlond, Q.C., Used.
19-in. x 10-ft., Sidney, Q.C., Used.
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24-in. x 12-ft., Sellers, P.C.G., Used.

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25-in., Superior, Sliding Head, Used.
25-in., Buffalo, Stationary Head, New.
28-in., Rockford, Sliding Head, Used.
26-in., Rockford, Sliding Head, Used.
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16-in. to 24-in., Steptoe, New.
20-in., Cincinnati, B.G., Used.
20-in., Smith & Mills, B.G., Used.

MILLERS

No. 1 Dow, Plain, New.
No. 2 Cincinnati, Universal, Used.
No. 3 Cincinnati, Plain, Used.
No. 2-B Milwaukee, Plain, Used.
No. 1½ American, Plain, New.
No. 0 Steptoe, Hand, New.
No. 3 Burke, Hand, New and Used.

GRINDERS

Norton, 10 x 30 in., Plain, Used.
Modern, 8 x 30 in., Plain, Used.
Fraser, 8 x 20 in., Universal, New.

BORING MILLS

42-in., Bullard, 2 heads, Used.
3-in., Bar Binnse, hor., Used.

MISCELLANEOUS

Bolt Cutters, Greenfield, 1½ in. and 2 in., New.
Hack Saws, Peerless & North Wales, New.
Hack Saws, No. 4 Marvel, Used.
Hack Saws, Kwik-Kut, 8 in., Used.
Hammers, 100 lbs., Little Giant, New.
Keyseaters, No. 2 and No. 4, Catlin, Used.
Pipe Machines, 2 in., 4 in., 6 in., Oster, New.
Presses, Watson & Stillman, 30 T. Hyd., Used.
Shears, Gray No. 1, Cap. 3/16-in. sheets, Used.
Slotters, 10-12-in. Drill, Used.

Look This List Over

2—3¼ x 4 in. Greenlee Flat Turret Lathes with bar and chucking equipment. Collets, round, square and hex. Die heads. Drill Holders, Tap Holders.
4—No. 6 Wood Tilted Turrets, bar equipment with die heads. Tool Holders, etc.

PLANERS

24 in. 28 in. 44 in

SHAPERS

16 in. 18 in. 24 in.

LATHES

Engine Lathes, various sizes and makes.

GRINDERS
CYLINDRICAL

10x30 12x48 16x72

UNIVERSAL CUTTER AND REAMER

Surface with magnetic chuck.
Heald Internal.

MILLING MACHINES

No. 2 "Rockford" plain with slotting and vertical attachments.
Universal No. 2 and No. 3 Kempsmith.
Briggs Manufacturing.
Becker Lincoln Pattern. Quick return and oil pump.

BORING MILLS

3A Universal.
"Rockford".

DRILLS

Morris, 3½ in. Radial with Speed Box. 25 in. Sliding Head.
Ball Bearing Sensitive—1-2-3-4-5-6 and 8 Spindles.
Miscellaneous shop equipment, benches tool room and shop accessories.

We buy good used tools—cash or exchange.

Let us know your requirements. We can save you money.

The M. D. Larkin Supply Company
Machinery Department
501 East Third St., Dayton, Ohio

1—1½-in. Landis Single Head Bolt Cutter.
1—No. 2 Lennox Rotary Bevel Shear.
1—1500-lb. Single Frame Bement Steam Hammer.
1—No. 3 Ryerson Cored Frame Punch 15-in. throat.
1—32-in.x12-ft.,2½-in.Spindle D.B.G.Lathe.
1—5-ft. Fosdick Heavy Duty Plain Radial Drill.
1—6-ft. Cincinnati-Bickford Heavy Pattern Plain Radial Drill.
1—No. 4 Cincinnati High Power Universal Milling Machine.
1—42-in. x 36-in. x 16-ft. Cincinnati Planer with two heads on cross rail.
1—24-in. x 30-ft. Klusman Engine Lathe.
2—Imperial Type No. 10 Ingersoll-Rand Air Compressors.

Also many other machine tools, wood working equipment, motors, blowers, etc. These tools are almost new, having been in service only two years. Write us for complete list and prices.

THE MECHANICAL MFG. CO.
Union Stock Yards, Chicago, Ill.

FOR SALE

2—Almost new, 20 x 8 Hendey Lathes, yoke head, Q.C.G., used 3 mos. Each..........$1000
1—14 x 6 Hendey Lathe, yoke head, Q.C.G., used 3 mos.... 650
1—No. 2C Bath Full Universal Grinder with about thirty attachments. Like new....... 550

THESE PRICES F. O. B. CARS

Asher Machinery Corporation
49-53 Mechanic St., Newark, N. J.
Mulberry 0127

Pratt & Whitney Lathes

2—Pratt & Whitney, new model, 7-in. x 32-in. Bench Lathes, complete with regular equipment also compound rest, traverse spindle grinder, tool post grinder, 4-in. combination chuck and two-speed grinder countershaft. Price, each $185.

STANDARD MACHINERY COMPANY
453 Chapel Street, New Haven, Conn.

MILLING MACHINES

No. 1½ New American Standard Milling Machine, plain power feed.
U. S. Hand Millers new, at exceptional prices.

FAIRBANKS, MORSE & CO.
917 Arch Street, Philadelphia, Pa.

BOTWINIK BROTHERS SPECIALS

1—Brown & Sharpe No. 3, 26-in. *Gear Cutter*.
1—Pratt & Whitney 14-in. *Vertical Surface Grinder*.
12—Toledo No. 0-49 *Straight Side Power Presses* (New).
3—Bryant No. 20 *Chucking Grinders* (New).
2—Brown & Sharpe No. 13 *Millers*.
1—Becker No. 5, No. 5-B, No. 5-C *Vertical Millers* (each).
3—American 40-in. Bevel *Cutting Band Saws*.
1—Bliss No. 73½ *B. G. Press*.
1—Becker-Brainerd, No. 3 *Plain Miller*.
1—Becker-Brainerd, No. 6 *Vertical Miller*, with rotary table.

All of the above tools guaranteed to be in excellent condition.

BOTWINIK BROTHERS
28-42 Drouve St. Bridgeport, Conn.

4—No. 60 Heald

Cylinder Grinders,

only slightly used, with long cross slide; condition guaranteed.

Excellent Draw Benches

at about one third new prices.

For sale by

Cyril J. Bath & Company
Machinery Merchants
1607 St. Clair Ave. N. E., Cleveland, Ohio.

REAL BARGAINS

2—20x10 Prentiss Lathes, single pulley drive, quick change gears.
1—18x8 Prentiss Lathe, single pulley drive, quick change gears.
1—20x10 Porter Lathe, quick change gears.
1—18x8 Lodge & Shipley Lathe, motor driven.
1—No. 3 Foster Screw Machine.
3—No. 70 Heald Grinders.
1—No. 4 Hendey Plain Milling Machine, single pulley drive.
1—No. 20B Bliss Power Press.

A Large Assortment of Other Tools

General Machinery Exchange
211 Centre St. and 149 Lafayette St.
New York City

$65

Six Brand New Flexible Shaft Equipments Complete, with Universal Motor, 110 v, Flexible Shaft, Hand Piece and Collet and Wrenches.

Standard Machinery Co.
455 Chapel St.,
New Haven, Conn.

GRINDERS

2—No. 2 MORSE 6-in. x 30-in. Plain Grinders Price $350.00 ea.
2—No. 1 MORSE 4-in. x 20-in. Plain Grinders Price $300.00 ea.

STANDARD MACHINERY COMPANY
455 Chapel St., New Haven, Conn.

UNIVERSAL MILLER

1—No. 2 CINCINNATI HI-POWER Single Pulley Drive. Price $1,400.00.
1—No. 2A Brown & Sharpe Single Pulley Drive. Price $875.00.
1—No. 2 GARVIN Cone Driven. Price $550.00.

STANDARD MACHINERY COMPANY
455 Chapel St., New Haven, Conn.

SLIGHTLY USED TOOLS FOR YOUR REPAIR SHOP

BORING MILLS

No. 1 Cleveland Horizontal.
No. 1 Beaman & Smith Horizontal.
34-in. King Vertical.
37-in. Colburn Vertical.

GEAR CUTTERS AND GRINDERS

No. 612 Fellows Gear Shaper.
No. 2½ Bilton Automatic Gear Miller.
No. 6½ Bilton Automatic Gear Miller.
10-in. x 24-in. B. & S. Universal Grinder.
No. 1 B. & S. Tool Grinder.
No. 1 Greenfield C & R Grinder.
20-in Taylor & Fenn Wet Tool Grinder.

LATHES

9-in. x 14-in., Porter Cable, High-Speed, Short Cut with lever draw-in. attachment, etc.
12 in. x 5 ft., Vernon Q.C.G.
13 in. x 5 ft., Worcester.
14 in. x 6 ft., Monarch.
16 in. x 8 ft., Reed.
1C in. x 8 ft., Nicholson & Waterman.
20 in. x 8 ft., F. F. Reed.
23 in. x 10 ft, David Pond.
21 in. x 13 ft, Porter.

SCREW MACHINES

No. 4 W & S, Type GFH, 1½ in.
2-in. x 24-in., J. & L. Flat Turret.
24-in. Davis Chucking.
⅜-in.-½-in., Model "A" Cleveland Automatic.
½-in. Model "B" Cleveland Automatic.
1¼-in., Model "C" Cleveland Automatic.
2-in., Model "C" Cleveland Automatic.
No. 22-SP, Garvin, Plain Head Turret Lathes.

SHAPERS AND PLANERS

14-in. Fox Shaper.
16-in. Eberhardt Bros. Shaper.
16-in., Gould & Eberhardt, S.P.D.
16-in., Kelly, B.G.
20-in., Kelly, B.G.
17-in. x 17-in. x 4-ft., Whitcomb Planer.
22-in. x 22-in. x 5-ft., Putnam Planer.
22-in. x 22-in. x 5-ft., Whitcomb Planer.
30-in. x 30 in. x 8 ft., Whitcomb Planer.
30-in. x 30-in. x 8-ft., Cleveland Open Side.
36-in. x 36-in. x 22-ft., Pond.

MISCELLANEOUS

40-lb. Bradley, Cushioned Helve Hammer.
50-lb. Bradley, Upright Helve Hammer.
125-lb. Beaudry, Peerless Hammer.
No. 8 25-ton, Greenerd Arbor Press.
3-ft., Prentice Bros. Radial Drill.
5-ft., Fosdick Plain Radial Drill.
1-spindle, Allen H.S.B.B. Drills.
4-spindle, Reed-Prentice H.S.B.B. Drills.
26-in., Henry & Wright Sensitive Radial.
36-in., Reed-Prentice, Upright Drill.
No. 4 Garvin, 4-spindle, Index Centers.
No. 2-B, Cochrane-Bly Cold Saw.
24 Surface Plates, 12 in. x 15 in.
No. 1 American Oil Separator.
No. 2 Tuttle Tapping Machine.

BROWNELL MACHINERY COMPANY
11-13 Eddy St., PROVIDENCE, R. I.

Good as new

at less than half price

1—No. 4A Standard S. A. Power Press with roll feed.

1—No. 5A Standard S. A. Power Press with roll feed.

26—No. 01 V. & O. S. A. Power Presses with dial feed and reels.

3—No. 2 V. & O. S. A. Power Presses.

9—No. 1 Baird Open Back Power Presses with roll feeds and reels.

15—No. 1 Adams Power Presses with roll feeds and reels.

1—No. 14 V. & O. Double Action Cam Press.

1—200-lb. Standard Auto Drop.

1—500-lb. Standard Auto Drop.

1—800-lb. Standard Auto Drop.

1—15-in. Potter & Johnston Shaper.

1—16-in. Stockbridge Shaper.

1—15-in. Davis & Egan Shaper.

2—24-in. Potter & Johnston Shapers.

2—24-in. x 24-in. x 6-ft. Whitcomb Blaisdell Planers.

1—24-in. x 24-in. x 6-ft. Gray Planer.

1—34-in. Colburn Vertical Chucking Machine.

1—42-ft. Colburn Vertical Boring Mill; two heads.

1—No. 3 Kempsmith Universal Milling Machine, vertical attachment.

1—14-in. x 6-ft. Prentice Engine Lathe, C. P. R., taper attachment, chuck.

1—14-in. x 8 ft. Reed Engine Lathe, C. P. R., taper attachment, chuck.

1—16-in. x 6-ft. Whitcomb-Blaisdell Engine Lathe, q. c. g., C. P. R., chuck.

1—18-in. x 6-ft. Monarch Engine Lathe, q. c. g., C. P. R., chuck.

The E. A. Eddy Machinery Co.
211 Eddy Street, Providence, R. I.

Special Opportunity on Milwaukee Milling Machines

1—No. 2-B UNIVERSAL....$1415
1—No. 2-B PLAIN......... 1040
Worth $2060 and $1680.

Used two months with extra special care, so new machines would be no better.

We have these Millers in the United States and before we instruct shipment to come forward to us, offer them at above low price for quick turnover, f.o.b. cars, Waynesboro, Pa.

Will accept payment in Canadian funds, so you will also save considerable, owing to premium for exchange.

Williams & Wilson Limited
84 Inspector Street, Montreal, P. Q.

The Structural and Sheet Metal Business is good. Better look up that machine today and write us.

6—Clev. E. F. Sing. End. Pchs. Arch. Jaw. 24 in. Thrt. Mtr. Dr., Cap. 1¼ in. x 1 in.
1—Ditto, 36 in. throat.
1—Ditto, 48 in. throat.
1—No. 2 Hilles & Jones Mtr. Dr. Hor. Punch 12 in. throat, Capacity 1 in. x 1 in.
1—No. 3 Quickwork Mtr. Dr. Shear, 36 in. throat. Cap. 3/16 in.
1—8 ft. Dreis & Krump M.D. Power Brake.
1—36 in. P. S. & W. Hand Brake or Folder.
1—No. 162-F Niag. 62 in. Ft. Power Shear, 18 gauge.
1—72 in. Loy & Nawrath Power Sq. Shear, ¼ in. Cap.
1—No. 3 Long & A. Sing. End Pch. or Shear, 6 in. throat.
50—Punch Presses, various sizes and makes.

The E. L. Essley Machinery Company
551-57 W. Washington Blvd., Chicago

1—42 in. x 42 in. x 12 ft. Powell Planer, 3 heads $2250
1—48 in. x 48 in. x 12 ft. Pond Planer, 4 heads $2500
1—Powell Planer, 36 in. widened to 60 in. between housings, 20 ft. bed, parallel drive, 2 heads $2150
1—33 in. x 60 in. LeBlond screw cutting extension bed, gap lathe, 16 ft. bed, latest model, quick change gear $2500

SPECIAL

2—Putnam 5 ft. Radial Drills in good order, each $450

The above tools are in excellent condition, available for immediate delivery, and prices quoted are f.o.b. cars Boston, Mass.

FACTORY & MILL SUPPLY CO.
137 Oliver St., Boston, Mass.

TOOLS FOR IMMEDIATE SHIPMENT

Air Compressor, Nagle Corliss, 9 x 8
Air Compressors, Franklin, 1[illegible] x 10 d 9 x 8
Automatics, National Acme, No. 52and 56
Boring Mill, Bullard, turret head, 34ain.
Boring Mill, 10 ft., 2 swivel heads
Drills, Std. Makes, 20-in., new, $111.50 ea. (6)
Flat Turret, 2 x 24 and 3 x 36 J. & L
Gear Cutter, G. & E., 36 in.
Grinder, Cutter and Reamer, Grand Rapids
Lathe, Fitchburg, low swing, 8 x 60 in.
Lathe, Hamilton, 14 in. x 6 ft., h.s., comp. rest.
Lathe, Hamilton, 18 in. x 8 ft., dbl. bk. gr. New
Lathe, Schumacher-Boye, 25 in. x 14 ft.
Miller, B. & S., No. 2, heavy, plain
Millers, Kempsmith, production, No. 32 (3)
Motors, G. E., ½ to 50 hp., 3-ph., new.
Planer, Pease, 24 x 24 x 6 ft.
Planer, Pond, 36 x 36 in. x 18 ft.
Radial, Canedy-Otto, 3½-in., plain. New
Screw Machine, Wood band, 1½ in.
Shaper, Smith & Mills, 14 in.
Shapers, O.&S., crank, 16, 20 and 24 in., B.G., new

The Osborne & Sexton Mchy. Co., Columbus, O
Branch—Dayton, O., 1118 Lindsey Bldg. X

DISC GRINDER

1—No. 14 BESLEY Double End Disc Grinder, 26-in. Discs R. & L. Geared Lever Tables and Disc Press. Price $400.00.

STANDARD MACHINERY COMPANY
455 Chapel St., New Haven, Conn.

Hendey Lathe

1—Practically new 16-in.x6-ft. HENDEY LATHE, complete with regular equipment and also taper attachment and BACKING-OFF attachment. Serial No. 20196.
1—Pratt & Whitney 16-in. x 8-ft. LATHE, complete with regular equipment and also taper attachment. Arrangement for relieving attachment. Excellent condition, late type.

STANDARD MACHINERY COMPANY
453 Chapel St., New Haven, Conn.

IDEAL OFFERINGS

LATHES

12 in. P & W Tool Makers taper and draw bar.
12 in. Hendey Hoke Head taper and draw bar.
12 in. Hendey Geared Head taper and draw bar.
16 in. Hendey Geared Head taper and draw bar.
18 in. Hendey Geared Head taper and draw bar.
14 in. American Geared Head and taper Att.

Lots of Reed 16 in. x 18 in., some with taper. All are A-1 or equal to new.

Please send for complete lists of bargains.

IDEAL MACHINERY CO.
Plainville, Conn., U. S. A.

SAMUEL T. FREEMAN & COMPANY, *Auctioneers*

Established November 12th, 1805 — **Nos. 1519-1521 Chestnut Street, Philadelphia, Pa.**

RECEIVER'S SALE IN EQUITY

By order of the United States District Court for the Eastern District of Penna. In equity, in the matter Wm. G. Keck, etc., vs. Bethlehem Motors Corporation. June Term, 1920. No. 2073.

The Two Valuable Plants and Property of Bethlehem Motors Corporation, Allentown, Pa., and Pottstown, Pa.

TUESDAY, WEDNESDAY, THURSDAY AND FRIDAY, APRIL 18, 19, 20, 21, 1922, AT 10 A.M. EACH DAY

ON THE PREMISES OF THE CORPORATION

REAL ESTATE—Allentown Plant: Manufacturing Plant—1-story brick-and-structural-steel buildings, with about 170,000 sq. ft., with heat, light and power and about 14 acres of ground.

Allentown Building Site: Valuable building site with structure thereon erected.

Pottstown Plant: Modern 2-story Brick Daylight Factory with offices in the front and approximately 45,000 sq. ft. of floor space, with lighting, heating and power plant and about 2 acres of ground.

SERVICE DEPARTMENT—About $325,000 worth of supplies of every kind for service on the 7,500 trucks now on the road.

MATERIAL—Approximately $1,000,000 of material for the manufacture of the Bethlehem motortruck including some 600 engines in the course of completion, springs, wheels, gears, transmissions, hardware and other materials.

GOOD WILL—Including Jigs and Fixtures, Drawings, Patterns and Patterns of the Bethlehem Motors Corporation.

MACHINERY—Comprising the equipment of both the Allentown and Pottstown Plants, modern machine tools, many of which are new, and all of which are in excellent shape including Hamilton, Le Blond, Hendy, Chard, Excelsior, Davis, Porter-Cable & Meyers Lathes, Direct and Belt Driven, Gould & Eberhardt, Potter & Johnson and Columbia Shapers, Cincinnati, Bickford, Ingersoll, Kearney & Trecker, Becker-Brainard, Dow, Garvin and Brown & Sharpe Plain, Horizontal, Vertical and Universal Millers, Hendy & Wright American, Hamilton, Garvin, Charlton, Natco, Snyder, Cincinnati, Minister & Cleveland single and multi-spindle and Radial Drill Presses, Whitcomb Planer, Surface Plane and Internal Grinders, Horizotal and Vertical Boring Mills, Hack Saws, Tool and Cutter Grinders, Centering Machines, "Hole Hog." Toledo Air Compressors, Screw Presses Gisholt & Steinle Turret Lathes, Greenard Arbor Presses, Slotters Piston Turning Valve, Drilling and Cylinder Boring Machines, Wood-Tilted Turret Lathes, Modern Wood-working Machinery, Equipment of Blacksmith Shop, Sanders, Blowers, Small Tools, 65 Motors from ¼ to 62 H. P., Generator, 50 H. P. Dynanometers, Shafting, Belting, etc., etc.

OFFICE FURNITURE AND EQUIPMENT—Including Mahogany and Oak Sanitary Flat, Roll-Top and Typewriter Desks, Arm, Side and Revolving Chairs, Typewriters, Adding Machines, Comptometers, Safes, Filing Cabinets, Rugs, etc.

CHARLES D. McAVOY, Esq., Special Master.
North American Building, Philadelphia.

CLINTON E. WOODS, Receiver.
Morris Building, Philadelphia.

HENRY, PEPPER, BODINE & STOKES, Esqs., Attorneys for Receiver, 2231 Land Title Building, Philadelphia.

ILLUSTRATED CATALOGUE WITH TERMS OF SALE, ITEMIZED DESCRIPTION OF THE PROPERY TO BE SOLD, ETC., WILL BE MAILED UPON APPLICATION TO SAMUEL T. FREEMAN & CO., 1519-1521 CHESTNUT ST., PHILADELPHIA, PA.

We want to purchase

1 GATE SHEAR

Capacity 48 in. x ¾ in. with 24 in. gap.

1 DOUBLE ANGLE SHEAR

Capacity 6 in. x 6 in. x ¾ in.

1 DOUBLE END PUNCH

Capacity ¾ in. hole thru ¾ in. plate. 36 in. gap one end, and 12 in. gap the other end.

The above machines for our new steel conveyor plant now being erected in Syracuse, N. Y.

THE LAMSON COMPANY
Lowell, Mass.
Please address General Superintendent

PRESS WANTED

Bliss No. 3, 4, or 5
Ferracute No. P3, P4, or P5

Plain or Geared

Give full Description as to Condition and Price.

Union Loom Works, Inc.
Boonville, N. Y.

FOR SALE

Gridley Automatics, 3¼ and 4¼ in.
Cone Automatic, 4 spindle, 1½ in.
Potter & Johnston, 6A.
Gould & Eberhardt Gashers, 3 spindle.
Gleason Generators, 6, 11 and 18 in.

All in A-1 shape. Some new.
None used on war work.

Cross Gear & Engine Co.
Detroit, Mich.

WANTED TO BUY

Rotary Annealing Furnace and Rotary Washers

Suitable for working light Metal parts

W-562, American Machinist
1570 Old Colony Bldg., Chicago, Ill.

---

54 in. BULLARD MAXIMILL

One Year Old.
A Bargain.

Blackman-Hill-McKee Machinery Co.
St. Louis

WANTED

Johannsen Gauges (Blocks and Plugs)

Give description and price.

Albany Machine & Tool Co., Albany, N. Y.

GRAND RAPIDS SPECIALS

1—9-in. Porter Cable Manufacturing Lathe.
1—9-in. Sunstrand Mfg. Lathe; 1—16-in. Chard Prod. Lathe; 1—16x7 Oliver QCG Lathe.
1—21x10 Schumacher-Boye Std. Lathe.
1—6-spindle Rockford 14-in. Gang Drill.
1—No. 2 Rockford High Power Miller.
1—No. 2 H. Becker Vertical Miller.
1—30x30x8 Pond Planer.

Ask for complete list

McMULLEN MACHINERY CO.
Grand Rapids, Mich.

WANTED

No. 1 Norton Universal Tool and Cutter

GRINDER

First-class condition. State price and location

W-581, American Machinist
10th Ave. at 36th St., New York City

LATHES

WE ARE OFFERING THE FOLLOWING BRAND NEW LATHES OF A WELL KNOWN MANUFACTURER AT 33 1-3% DISCOUNT FROM PRESENT LIST PRICES. WRITE FOR PRICES AND SPECIFICATIONS.
2—14-in. x 6-ft. 2—16-in. x 6-ft. 4—16-in. x 8-ft.

STANDARD MACHINERY COMPANY
455 Chapel St., New Haven, Conn.

Thread Milling Machines

Trundle Automatic Thread Milling Machines, magazine feed, 1¾-in. spindle. Machines used for demonstration only. Smalley General Flange Threading Machine at very attractive price.

FAIRBANKS, MORSE & CO.
917 Arch Street, Philadelphia, Pa.

POSITIONS VACANT

EMPLOYMENT

POSITIONS WANTED

POSITIONS VACANT

Connecticut

WANTED—A man who is competent to take the oversight of the grinding and finishing of ball bearings from the hardening to finished product. Give full particulars as to age and experience; also wages expected. P-568, Am. Mach.

In Replying to "Blind" Ads

be careful to put on envelope the key number in the ad and also local address of office to which reply is sent.

10th Ave. at 36th St., New York.
935 Real Estate Trust Bldg., Phila.
533 Leader-News Bldg., Cleveland.
1570 Old Colony Bldg., Chicago.
531 Rialto Bldg., San Francisco.

Important

Original letters of recommendation or other papers of value should not be enclosed to unknown correspondents — send copies.

0195

POSITIONS VACANT

FOREMAN wanted, ice skates. Large established manufacturer interested in hiring a high grade foreman who has had actual experience in making ice skates. Interview will be arranged with the right man. In your first letter, tell me your age, number of years' experience you have had, for what companies you have worked, how long you have been manufacturing ice skates, nationality, salary desired to start. Address your reply to P-553, Am. Mach.

New Jersey

MACHINIST wanted to travel acting as demonstrator on hand tools. One with some sales experience preferred. Address "Travel," 810 Broad St., Newark, N. J.

TOOL AND DIE MAKER FORMAN ON DIE CASTING DIES

Preferably one thoroughly experienced on aluminum work. To quick acting, quick thinking, experienced executive, offer exceptional future. Reply promptly, stating past experience, present position, salary expected, and time you could report.

Die Casting Division
LIGHT MFG. & FDRY. Co.
Pottstown, Pa.

EXECUTIVES

Engineers and men of proven ability seeking positions find our service satisfactory. Our Mr. H. H. Harrison can confidentially negotiate for you suitable connections, as he has successfully done for thousands of others since 1909. Inquiries invited.

The National Business Bourse, Inc.
Confidential Negotiators
Association Bldg., Chicago.

POSITIONS VACANT

MECHANICAL draftsman, experienced in electric motor design. State age, experience and salary expected. P-579, Am. Mach.

New York

GERMANY — Chief engineer, also works manager wanted for executive positions by leading machine tool concern near Berlin. Only men of proven ability and successful record, with extensive experience in design of up-to-date machine tools and familiar with the production end need apply. State age and particular.s P-577, Am. Mach.

EMPLOYMENT AGENCIES

WE have a number of exceptionally good openings for manufacturing executives and technical men, such as works managers superintendents, production engineers, foundry executives, foremen of all kinds, mechanical engineers, designers, draftsmen. You are under no obligation to us unless you accept a position through our service, which is certainly worthy of your investigation. National Vocational Service, 64 W. Randolph St., Chicago, Illinois.

EMPLOYMENT SERVICE

A LEADING organization desiring to fill an important position, for obvious ethical and other reasons, cannot invite directly the candidacy of any particular man. Similarly, no well-connected man will exploit personally his own qualifications, no matter how receptive he may be to overtures. The undersigned has been retained by a national clientele for many years, as a medium for negotiating preliminaries in such cases. Your permission to send booklet discussing this problem and describing the service, will in no degree obligate or compromise you. Strictly confidential. R. W. Bixby, Inc., 307 Lockwood Bldg., Buffalo, N. Y.

POSITIONS WANTED

MACHINE shop superintendent with up-to-date methods on all kinds of machine work would like to make change. PW-555, Am. Mach.

Connecticut

MECHANICAL engineer, age 35, 18 years' experience tool and machine design, production and plant engineering, research work. A-1 references. Expert in interchangeable work such as fire arms and small motors and generators. Location immaterial. Salary reasonable. PW-552, Am. Mach.

Massachusetts

MACHINIST, toolmaker for nine years; some experience designing, draftsman; technical training; age 26; go any place. PW-575, Am. Mach.

POSITIONS WANTED

SALES engineer type of salesman, acquainted with Middle Atlantic states and Eastern territory, desires connection. Proven selling ability combined with comprehensive knowledge of modern methods and a wide acquaintance among users of machine tools. Not an order taker, but an energetic and steady business getter of the type required by present conditions. PW-543, Am. Mach.

PRODUCTION or factory manager with twenty years' experience in the manufacture of high grade interchangeable machinery small parts and machine tools. Familiar with cost saving production methods, cost systems, budget control of finances, design of special equipment, development of new products, and sales promotion. Successful in past connections. Best references. Location immaterial. PW-560, Am. Mach.

New Jersey

AN expert factory manager and business organizer with very successful history directing large industrial companies is now available for appointment as factory manager or equivalent position in business where a man of outstanding ability is needed, firm which has been mismanaged and requires thorough reorganizing or where present head desired to be retired but cannot find the man to carry on is particularly sought; my success is due to organizing ability, energy and knack of handling men so as to get the best out of them; no business would be too large; the larger the business the greater would be advertiser's value, but a small business with scope and financial resources could be successfully expanded. PW-580, Am. Mach.

AN expert designer with ten years' practical experience in the design of tools, dies, fixtures, and special machinery, seeks a position where industry and ability will be appreciated. The applicant has successfully filled positions requiring executive ability. PW-578, Am. Mach.

EXECUTIVE; 10 years' practical and 5 years' technical experience on manufacturing and die-castings, any position where trust and ability is needed. PW-564, Am. Mach.

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FOREMAN, expert mechanic with long experience in development work and manufacture of instruments, telephones and related apparatus, also check writing machines, etc., open for responsible position. Address PW-563, Am. Mach.

MASTER mechanic, practical mechanic and first class machine and tool designer; practical experience, with good technical education. Familiar with modern manufacturing methods, processing, limits system, time study and rate setting. Member of the A. S. M. E. Age 36; married. At present employed. PW-569, Am. Mach.

SUPERINTENDENT-Machinist tool-maker by trade, technical graduate, wide experience organizing, planning and handling help in plant where interchangeable parts are manufactured. Age 36. Best of references. Any location considered. PW-559, Am. Mach.

New York

BROWN Sharpe automatic setup man. Cam designer capable of taking charge of automatics. PW-571, Am. Mach.

MECHANICAL draftsman, nine years' varied experience as mechanic, tool and special machinery designer; technical education; can fit in as assistant to production or shop manager. PW-574, Am. Mach.

MECHANICAL engineer, 33, twelve years' experience tool and machine design and experimental work, desires responsible position. PW-573, Am. Mach.

FOREMAN, toolmaker, age 44, 28 years' broad experience on all kinds of tools, dies, production, experimental and automatic machinery. Able to take full charge or any responsibility where hard work, common sense and loyalty would be appreciated. Salary, minimum $45 week. PW-554 Am. Mach.

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PRODUCTION manager or assistant to chief executive. At present production manager of $7,000,000 concern. Thorough knowledge of large scale manufacturing. Location in east preferred. PW-576, Am. Mach., Old Colony Bldg., Chicago, Ill.

PATENT ATTORNEYS

PATENTS, C. L. Parker, patent attorney, McGill Bldg., Washington, D. C. Inventor's handbook sent upon request.

PATENTS—Send for form "Evidence of Conception" to be signed and witnessed. Form fee schedule, information, free. Lancaster and Allwine, 262 Ouray Bldg., Washington, D. C.

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Connections with modern up-to-date manufacturing concern to manufacture and sell new home dishwashing machine. A real labor saver. It washes and sterilizes thoroughly the family dishes and cooking utensils in a minute. Dishpan entirely eliminated. Also for commercial use. Capacity 1,000-1,500 dishes per hour. Can be sold to retail under $100.00. Will give full details to parties, interested in making proposition only. BO-567, Am. Mach.

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Tools that are easy to manipulate.
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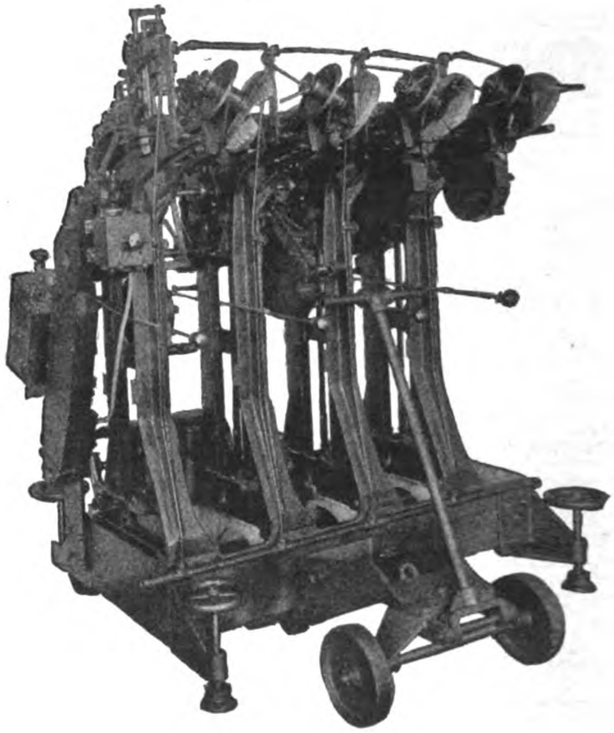

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For Alphabetical Index See Last Page

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Carborundum Co., Niagara Falls.
Gardner Mch. Co., Beloit

Abrasive Materials
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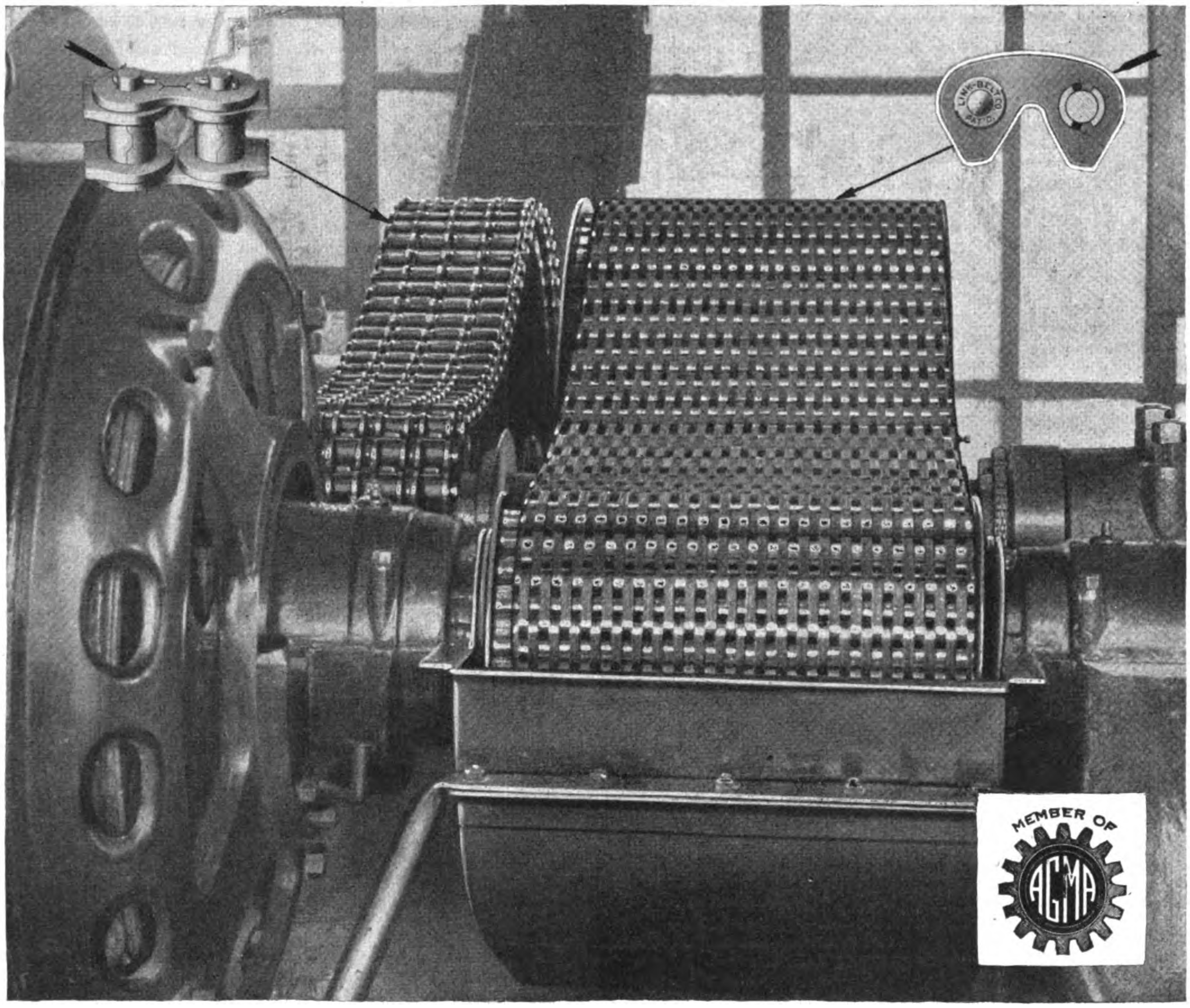

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Cranes, Hand (See Hoists, Hand)

Cranes, Locomotive
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Cranes, Traveling
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Curtis Pneu. Mchy. Co., St. Louis
Harrington, Son & Co., Ed., Phila.
Link-Belt Co., Chicago, Philadelphia
Northern Eng. Wks., Detroit
Pawling & Harnischfeger Co., Milwaukee
Reading Chain Block Corp., Reading
Shepard Elec. C. & H. Co., Montour Falls
Toledo Crane Co., Bucyrus

Crank Pin Turning Machines
Underwood Corp., H. B., Philadelphia

Cut-Out, Electrical
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Cutters, Gear
Brown & Sharpe Mfg. Co., Providence
National Tool Co., Cleveland
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol

Cutters, Milling
Becker Milling Mch. Co., Hyde Park
Brown & Sharpe Mfg. Co., Providence
Cowles Tool Co., Cleveland
Detroit Twist Drill Co., Detroit
Geometric Tool Co., New Haven
Ingersoll Milling Mch. Co., Rockford
Lovejoy Tool Co., Springfield, Vt.
Morse Twist D. & Mch. Co., New Bedford
National Tool Co., Cleveland
National Twist D. & T. Co., Detroit
Pratt & Whitney Co., Hartford
Union Twist Drill Co., Athol
Whitney Mfg. Co., Hartford

Cutters, Thread
Rivett Lathe & Grinder Co., Boston
Universal Mch. Co., Bowling Green

Cutting-Off Machines
Armstrong-Blum Mfg. Co., Chicago
Armstrong Bros. Tool Co., Chicago
Automatic Mach. Co., Bridgeport.
Brown & Sharpe Mfg. Co., Providence
Cochrane-Bly Co., Rochester.
Earle Gear & Mach. Co., Phila.
Etna Mch. Co., Toledo
Garvin Mach. Co., N. Y.
Gorton Mach. Co., Geo., Racine
Greenfield Tap & Die Corp., Greenfield
Newton Mach. Tool Wks., Phila.
Vandyck Churchill Co., N. Y.

Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)

Cutting-Off Tools
Armstrong Bros. Tool Co., Chicago
Pratt & Whitney Co., Hartford
Western T. & Mfg. Co., Springfield, O.
Williams & Co., J. H., Brooklyn

Cutting Oil Filters (See Oil Filtering Systems)

Dealers, Machinery (See Searchlight Section)
Asher Machy. Corp., Newark
Bath & Co., Cyril J., Cleveland
Botwinik Bros., New Haven
Brownell Mchy. Co., Providence
Cadillac Tool Co., Detroit
Eddy Mchy. Co., E. A., Providence
Essley Mchy. Co., Chicago
Factory & Mill Supply Co., Boston
Freeman & Co., Samuel T., Phila.
Garvin Mach. Co., N. Y.
Gelb & Co., J., N. Y.
General Mchy. Exchange, N. Y.
Hill, Clarke & Co., Chicago
Hyman & Sons, Jos., Philadelphia
Ideal Machinery Co., Plainsville.
Lamberg & Co., A., N. Y.
Larkin Supply Co., M. D., Dayton
McMullen Mchy. Co., Grand Rapids
N. J. Mchy. Exch., Newark
Niles & Co., F. H., Jersey City
Niles-Bement-Pond Co., N. Y.
Occidental & Oriental Trading Co., San Francisco
Osborne & Sexton Mchy Co., Columbus
Prentiss & Co., Henry, N. Y.
Purinton & Smith, Hartford
Ryerson & Son, Jos. T., Chicago
Simmons Mach. Co., Albany
Standard Mchy. Co., New Haven
Stokvis & Sons, R. S., N. Y.
Toomey, Frank, Philadelphia
Vandyck Churchill Co., N. Y.
Wayne Mchy. Co., Fort Wayne

Diamond Tools
Crafts & Co., Arthur A., Boston
Desmond-Stephan Mfg. Co., Urbana
Dickinson, Thomas L., N. Y.
Wheel Trueing Tool Co., Detroit

Die Making Machines
Cochrane-Bly Co., Rochester
Johnson Tool Co., Providence
Keller Mech. Eng. Co., Brooklyn

Dies, Forging
Keller Mech. Eng. Co., Brooklyn
Steel Products Eng.Co., Springfield, O.

Dies, Self Opening, Adjustable
Eastern Mach. S. Corp., New Haven
Geometric Tool Co., New Haven
Jones & Lamson Mach Co., Springfield, Vt.
Murchey Mch. & T. Co., Detroit
Victor Tool Co., Waynesboro.

Dies, Sheet-Metal and Sub-Press (See Tool Work)

Dies, Threading-Opening
Eastern Mch. S. Corp., New Haven
Errington Mech. Laboratory, N. Y.
Geometric Tool Co., New Haven
Greenfield Tap & Die Corp., Greenfield
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Mach. Co., Waynesboro
Murchey Mch. & T. Co., Detroit
National Acme Co., Cleveland
National Mchy. Co., Tiffin
Steel Products Eng.Co., Springfield, O.
Victor Tool Co., Waynesboro.
Warner & Swasey Co., Cleveland

Dividing Heads
Knight Mchy. Co., W. B., St. Louis

Dogs, Lathe and Milling Machine
Armstrong Bros. Tool Co., Chicago
Williams & Co., J. H., Brooklyn

Dressers, Grinding Wheel
Bay State Stamp. Co., Worcester
Crafts & Co., Arthur A., Boston
Clemson Bros. Inc., Middletown
Desmond-Stephan Mfg. Co., Urbana
Norton Co., Worcester

Drill Holders
Armstrong Bros. Tool Co., Chicago

Drill Speeders
Graham Mfg. Co., Providence
Turner Mach. Co., Danbury

Drilling Attachments
Hjorth Lathe & Tool Co., Boston

Drilling Machine Heads
Baush Mch. T. Co., Springfield, Mass
Hoefer Mfg. Co., Freeport.
Langelier Mfg. Co., Cranston
Nelson-Blanck Mfg. Co., Detroit

Drilling Machines, Automatic
Baush Mch. T. Co., Springfield, Mass.
Langelier Mfg. Co., Cranston
Nat'l Automatic Tool Co., Richmond

Drilling Machines, Bench
Ames Co., B. C., Waltham
Barnes Co., W. F. & John, Rockford
Cincinnati (O.) Electrical Tool Co.
Clark Elec. Co., Jas., Jr., Louisville
Clemson Bros. Inc., Middletown
Henry & Wright Mfg. Co., Hartford
Hoefer Mfg. Co., Freeport
Langelier Mfg. Co., Cranston
Millers Falls Co., Millers Falls
Robinson Tool Wks., Waterbury
Silver Mfg. Co., Salem
Standard Elect. T. Co., Cincinanti
Taylor & Fenn Co., Hartford
U. S. Electrical Tool Co., Cincinnati

Drilling Machines, Electric and Pneumatic
Chicago Pneumatic Tool Co., N. Y.
Cincinnati (O.) Elect. Tool Co.
Clark Elec. Co., Jas., Jr., Louisville
Independent Pneu. T. Co., Chicago
Louisville Elec. Mfg. Co., Louisville.
Neil & Smith Elec. T. Co., Cincinnati
Silver Mfg. Co., Salem
Standard Elect. T. Co., Cincinanti
U. S. Elec. Tool Co., Cincinnati
Wisconsin Elect. Co., Racine

Drilling Machines, Gang
Barnes Drill Co., Rockford
Cincinnati (O.) Bickford Tool Co.
Colburn Mach. Tool Co., Cleveland
Foote-Burt Co., Cleveland
Fosdick Mch. Tool Co., Cincinnati
Henry Wright Mfg. Co., Hartford
Langelier Mfg. Co., Cranston
Moline Tool Co., Moline
Silver Mfg. Co., Salem, O.
Taylor & Fenn Co., Hartford

Drilling Machines, Heavy Duty
Betts Mach. Co., Rochester
Buffalo Forge Co., Buffalo
Colburn Mach. Tool Co., Cleveland
Foote-Burt Co., Cleveland
Fosdick Mch. Tool Co., Cincinnati
Hoefer Mfg. Co., Freeport
Minster Mch. Co., Minster
Ryerson & Son, Jos. T., Chicago

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)

Drilling Machines, Multiple Spindle
Baush Mch. T. Co., Springfield, Mass.
Foote-Burt Co., Cleveland
Fox Mch. Co., Jackson, Mich.
Harrington Son & Co., Ed., Phila
Langelier Mfg. Co., Cranston
National Acme Co., Cleveland
Nat'l Automatic Tool Co., Richmond
Newton Mach. Tool Wks., Phila.
Sellers & Co., Wm., Philadelphia
Turner Mach. Co., Danbury

Drilling Machines, Radial
American Tool Wks. Co., Cincinnati
Baush Mch. T. Co., Springfield, Mass.
Betts Mach. Co., Rochester
Cincinnati (O.) Bickford Tool Co.
Dreses Mach. Tool Co., Cincinnati
Fosdick Mach. Tool Co., Cincinnati
Harrington Son & Co., Ed., Phila.
Henry & Wright Mfg. Co., Hartford
Morris Mach. Tool Co., Cincinnati
Mueller Mach. Tool Co., Cincinnati
Newton Mach. Tool Wks., Phila.
Reed-Prentice Co., Worcester
Ryerson, Jos. T. & Son, Chicago
Sellers & Co., Wm., Philadelphia

Drilling Machines, Sensitive
Buffalo Forge Co., Buffalo
Henry & Wright Mfg. Co., Hartford
Langelier Mfg. Co., Cranston
Leland-Gifford Co., Worcester
Reed-Prentice Co., Worcester
Royersford F. & M. Co., Royersford
Taylor & Fenn Co., Hartford
Wisconsin Elect Co., Racine

Drilling Machines, Turret
Nat'l Automatic Tool Co., Richmond
Turner Mach. Co., Danbury

Drilling Machines, Vertical
Barnes Co., W. F. & John, Rockford
Barnes Drill Co., Rockford
Baush Mch. T. Co., Springfield, Mass.
Betts Mach. Co., Rochester
Cincinnati (O) Bickford Tool Co.
Colburn Mach. Tool Co., Cleveland
Foote-Burt Co., Cleveland
Fosdick Mch. Tool Co., Cincinnati
Harrington Son & Co., Ed., Phila.
Henry & Wright Mfg. Co., Hartford
Hoefer Mfg. Co., Freeport
Knight Mchy. Co., W. B., St. Louis
Langelier Mfg. Co., Cranston
Leland-Gifford Co., Worcester
Reed-Prentice Co., Worcester
Royersford F. & M. Co., Royersford
Silver Mfg. Co., Salem, O.
Taylor & Fenn Co., Hartford
Turner Mach. Co., Danbury

Drills, Center
Detroit Twist Drill Co., Detroit
Morse Twist D. & M. Co., New Bedford
National Twist D. & T. Co., Detroit
Pratt & Whitney Co., Hartford
Slocomb Co., J. T., Providence
Union Twist Drill Co., Athol

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago
Detroit Twist Drill Co., Detroit
Greene, Tweed & Co., N. Y.
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol

Drills, Twist and Flat
Buckeye Twist Drill Co., Alliance
Detroit Twist Drill Co., Detroit
Fast Feed D. & T. Corp., Toledo

Latrobe Tool Co., Latrobe
Morse Twist D. & M. Co., New Bedford
National Twist D. & T. Co., Detroit
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Brown Inst. Co., Philadelphia
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Elevating Trucks (See Trucks)

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Albro-Clem Elevator Co., Phila.
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Gorton Mach. Co., Geo., Racine
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Watson-Stillman Co., N. Y.

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Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Fans, Exhaust
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

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Nicholson File Co., Providence
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Watson-Stillman Co., N. Y.

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Forging Machinery
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Bradley & Son, C. C., Syracuse
National Machinery Co., Tiffin

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Bearings Co. of America, Lancaster
Universal Mch. Co., Bowling Green
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American Gas Furnace Co., N. Y.
American Industrial Furnace Corp., Boston
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Greenfield Tap & Die Corp., Greenfield
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Gear Blanks
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Bilgram Mach. Wks., Philadelphia
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Flather & Co., Nashua
Garvin Mach. Co., N. Y.
Gleason Wks., Rochester
Gould & Eberhardt, Newark
Harrington, Son & Co., Ed., Phila.
Newark Gear Cut. Mch. Co., Newark
Newton Mach. Tool Wks., Phila.
Waltham Mach. Wks., Waltham
Whiton Mch. Co., D. E., New London

Gear Tempering Machinery
Gleason Wks., Rochester

Gear Testing Machinery
Adams Co., Dubuque
Brown & Sharpe Mfg. Co., Providence
Gisholt Mach. Co., Madison
Gleason Wks., Rochester
Newark Gear Cut. Mch. Co., Newark

Gear Tooth Rounders
Cross Gear & Eng. Co., Detroit

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Brown & Sharpe Mfg. Co., Providence
Brown Co., A. & F., N. Y.
Caldwell & Son Co., H. W., Chicago
Franklin Die Cast. Corp., Syracuse
Grant Gear Wks., Boston
Horsburgh & Scott Co., Cleveland
Jones Fdry. & Mch. Co., W. A., Chicago
Link-Belt Co., Chicago, Philadelphia
Philadelphia Gear Wks., Philadelphia

Gears, Cut
Adams Co., Dubuque
Albaugh Dover Co., Chicago
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Baush Mch. T. Co., Springfield, Mass.
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Brown & Sharpe Mfg. Co., Providence
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Chicago Rawhide Mfg. Co., Chicago
Cincinnati Gear Co., Cincinnati
Connecticut Gears, Waterbury
Diefendorf Gear Corp., Syracuse
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Fellows Gear Shaper Co., Springfield, Vt.
Flather & Co., Nashua
Foote Bros. Gear & M. Co., Chicago
Garvin Mach. Co., N. Y.
Gleason Wks., Rochester
Grant Gear Wks., Boston
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Niles-Bement-Pond Co., New York
Philadelphia Gear Wks., Philadelphia
Simonds Mfg. Co., Pittsburgh

Gears, Forged
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Geometric Tool Co., New Haven
National Acme Co., Cleveland

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Heald Mach. Co., Worcester
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Pratt & Whitney Co., Hartford
Rivett Lathe & Grinder Co., Boston
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Cutter and Reamer
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Blount Co., J. G., Everett
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Cincinnati (O) Milling Mch. Co.
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Gisholt Mach. Co., Madison
Greenfield Tap & Die Corp., Greenfield
Heald Mach. Co., Worcester
Landis Tool Co., Waynesboro
LeBlond Mch. T. Co., R.K., Cincinnati
Middlesex Mch. Co., Hartford
Noble & Westbrook Mfg. Co., Hartford
Norton Co., Worcester
Pratt & Whitney Co., Hartford
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Sellers & Co., Wm., Philadelphia
Sterling Grind. Wheel Co., Tiffin, O.
Taylor & Fenn Co., Hartford
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U. S. Elec. Tool Co., Cincinnati
Walker Co., O. S., Worcester
Wilmarth & Morman Co., Grand Rapids

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Landis Tool Co., Waynesboro
Middlesex Mch. Co., Hartford
Norton Co., Worcester.
Pratt & Whitney Co., Hartford
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Sanford Mfg. Co., F. C., Bridgeport
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Walker Co., O. S., Worcester
Whitney & Son, Baxter D., Winchendon
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Die
Abrasive Mch. T. Co., E. Providence
Bignall & Keeler Mch. Co., Edwardsville
Blanchard Mach. Co., Cambridge
Diamond Mach. Co., Providence
Geometric Tool Co., New Haven
Heald Mach. Co., Worcester
Middlesex Mch. Co., Hartford
Murchey Mch. & T. Co., Detroit
National Acme Co., Cleveland
National Mchy. Co., Tiffin
Newton Mach. Tool Wks., Phila.
Noble & Westbrook Mfg. Co., Hartford
Wilmarth & Morman Co., Grand Rapids

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Badger Tool Co., Beloit
Besly & Co., Charles H., Chicago
Diamond Mach. Co., Providence
Gardner Mch. Co., Beloit
Graham Mfg. Co., Providence
Rowbottom Mach. Co., Waterbury

Grinding Machines, Drill
Greenfield Tap & Die Corp., Greenfield
Louisville Elect. Mfg. Co., Louisville
Safety Emerg. Wheel Co., Springfield, O.
Sellers & Co., Wm., Philadelphia
Sterling Grind. Wheel Co., Tiffin, O.
U. S. Elec. Tool Co., Cincinnati
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Face
Blanchard Mach. Co., Cambridge
Detroit Mch. Tool Co., Detroit
Diamond Mach. Co., Providence
Graham Mfg. Co., Providence

Grinding Machines, Floor
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
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Detroit Mch. Tool Co., Detroit
Diamond Mach. Co., Providence
Forbes & Myers, Worcester
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Norton Co., Worcester
Ransom Mfg. Co., Oshkosh
Royersford F. & M. Co., Royersford
Safety Emery. Wheel Co., Springfield, O.
Sterling Grand. Wheel Co., Tiffin
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Gage
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Landis Tool Co., Waynesboro
Middlesex Mch. Co., Hartford
Rivett Lathe & Grind. Co., Boston
Wilmarth & Morman Co., Grand Rapids

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Garvin Mach. Co., N. Y.
Greenfield Tap & Die Corp., Greenfield
Heald Mach. Co., Worcester
Landis Tool Co., Waynesboro
Middlesex Mch. Co., Hartford
Pratt & Whitney Co., Hartford
Rivett Lathe & Grinder Co., Boston
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Neil & Smith Elec. T. Co., Cincinnati
Stroud, Arva, New York
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Wisconsin Elect. Co., Racine

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Landis Tool Co., Waynesboro
Rivett Lathe & Grinder Co., Boston
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Ring Wheel
Badger Tool Co., Beloit
Besly & Co., Charles H., Chicago
Diamond Mach. Co., Providence
Gardner Mch. Co., Beloit

Grinding Machines, Snagging
Blount Co., J. G., Everett
Diamond Mach. Co., Providence
Ransom Mfg. Co., Oshkosh
Walker Co., O. S., Worcester

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Abrasive Mch. T. Co., E. Providence
Blanchard Mach. Co., Cambridge
Brown & Sharpe Mfg. Co., Providence
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Diamond Mach. Co., Providence
Graham Mfg. Co., Providence
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Middlesex Mch. Co., Hartford
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Noble & Westbrook Mfg. Co., Hartford
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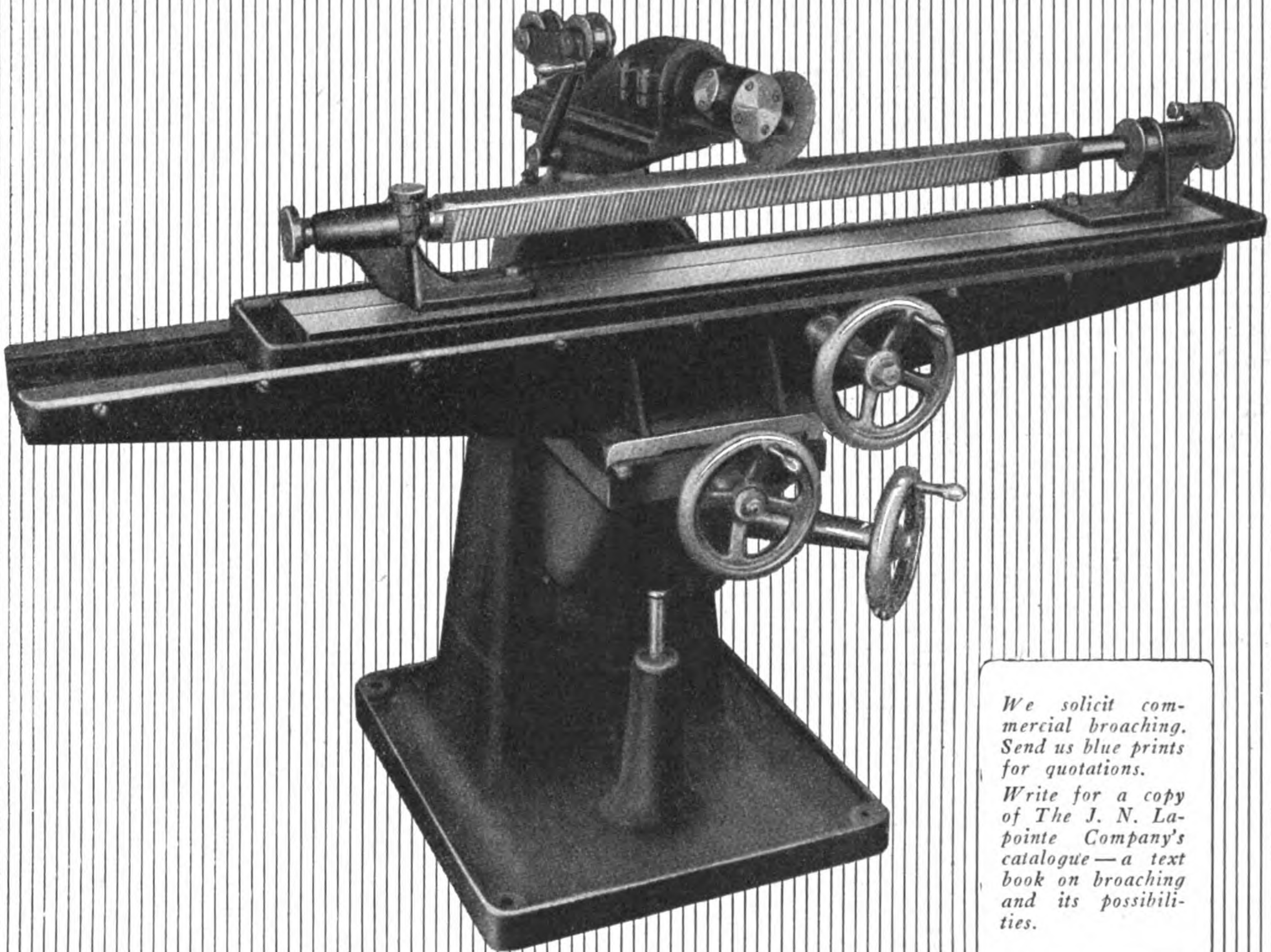

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Hangers, Shafting
Armstrong Bros., Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence
Jones Fdry. & Mch. Co., W. A., Chicago
Royersford F. & M. Co., Royersford

Hardening, Case-Hardening and Tempering
General Mach. Wks., York
Hartford Mch. Screw Co., Hartford

Hardness Testing Apparatus
Shore Instrument & Mfg. Co., N. Y.

Hobbing Machines
Adams Co., Dubuque
Cincinnati (O) Gear Cutting Mch. Co.
Gould & Eberhardt, Newark
Newark Gear Cut. Mch. Co., Newark

Hobs
Brown & Sharpe Mfg. Co., Providence
Greenfield Tap & Die Corp., Greenfield
National Tool Co., Cleveland
Newark Gear Cut. Mch. Co., Newark
Philadelphia Gear Wks., Philadelphia
Union Twist Drill Co., Athol

Hoists and Cranes, Electric
Link-Belt Co., Chicago, Philadelphia
Northern Eng. Wks., Detroit
Pawling & Harnischfeger Co., Milwaukee
Reading Chain Block Corp., Reading
Shepard Elec. C. & H. Co., Montour Falls
Toledo Crane Co., Bucyrus
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Hoists, Hand
Canton Fdry. & Mach. Co., Canton
Ford Chain Block & Mfg. Co., Phila.
Harrington, Son & Co., Ed, Phila.
Reading Chain Block Co., Reading

Hoists, Pneumatic
Chicago Pneumatic Tool Co., N. Y.
Curtis Pneu. Mchy. Co., St. Louis
Independent Pneu. T. Co., Chicago
Sullivan Machy Co., Chicago

Holders-On, Pneumatic
Chicago Pneumatic Tool Co., N. Y.
Independent Pneu. T. Co., Chicago

Hydraulic Leather
Schieren Co., Chas. A., N. Y.

Hydraulic Machinery
Hydraulic Press Mfg. Co., Mt. Gilead
Oilgear Co., Milwaukee
Watson-Stillman Co., N. Y.

Igniters, Gas Engine
Doehler Die Casting Co., Brooklyn

Indicators, Speed and Test
Brown & Sharpe Mfg. Co., Providence
Marvin & Casler Co., Canastota
Starrett Co., L. S., Athol

Jacks, Hydraulic
Watson-Stillman Co., N. Y.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago

Japans
Zeller Lacquer Mfg. Co., N. Y.

Jigs & Fixtures (See Contract Work)

Kettles, Soda
Brown & Sharpe Mfg. Co., Providence
Gray & Prior Mach. Co., Hartford
Manufacturing Equip & Eng. Co., Framingham

Keyseating Machines
Davis Mch. Co., C. F., Rochester
Lapointe Co., J. N., New London
Lapointe Mach. Tool Co., Hudson
Mitts & Merrill, Saginaw
Morton Mfg. Co., Muskegon Heights
National Mch. Tool Co. Cincinnati
Newton Mch. Tool Wks., Phila.

Keys, Machine
Moltrup Steel Product Co., Beaver Falls
Morton Mfg. Co., Muskegon Heights
Whitney Mfg. Co., Hartford

Knurl Holders
Williams & Co., J. H., Brooklyn

Lamps, Electrical
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Lathe Attachments
Ames Co., B. C., Waltham
Flather & Co., Nashua
Rivett Lathe & Grinder Co., Boston
Walcott Lathe Co., Jackson

Lathe Tools
Armstrong Bros. Tool Co., Chicago
Gisholt Mach. Co., Madison
Lovejoy Tool Co., Springfield, Vt.
Mayhew Steel Products, N. Y.
Western T. & Mfg. Co., Springfield, O.
Williams & Co., J. H., Brooklyn

Lathes, Automatic and Semi-Automatic
Gisholt Mach. Co., Madison
Jones & Lamson Mach. Co., Springfield, Vt.
National Acme Co., Windsor, Vt.
Potter & Johnson Mch. Co., Pawtucket
Reed-Prentice Co., Worcester
Steinle Turret Mach. Co., Madison

Lathes, Bench
Ames Co., B. C., Waltham
Blount Co., J. G., Everett
Diamond Mach. Co., Providence
Elgin Tool Wks., Elgin
Greenfield Tap & Die Corp., Greenfield
Hjorth Lathe & Tool Co., Boston
Monitor Lathe Wks., Arlington
Potter Tool & Mch. Wks., N. Y.
Pratt & Whitney Co., Hartford
Rivett Lathe & Grinder Co., Boston
Seneca Falls Mfg. Co., Seneca Falls
South Bend Lathe Wks., South Bend
Stark Tool Co., Waltham
Van Norman M. Tool Co., Springfield, Mass.
Wade-American Tool Co., Waltham

Lathes, Boring
Gisholt Mach. Co., Madison
Potter & Johnston Mach. Co., Pawtucket

Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)

Lathes, Engine
American Tool Wks. Co., Cincinnati
Barnes Co., W. F., & John, Rockford
Barnes Drill Co., Rockford
Blount Co., J. G., Everett
Bradford, Mch. T. Co., Cincinnati
Carroll-Jamieson Mch. T. C., Batavia
Champion Tool Wks. Co., Cincinnati
Fitchburg Mach. Wks., Fitchburg
Flather & Co., Nashua
Gisholt Mach. Co., Madison
Greaves Klusman T. Co., Cincinnati
Hamilton Mach. Tool Co., Hamilton
LeBlond M. T. Co., R. K., Cincinnati
Lodge & Shipley Mch. Tool Co., Cincinnati
Monarch Mach. Tool Co., Sidney
Morris Mach. Tool Co., Cincinnati
Mueller Mach. Tool Co., Cincinnati
Myers Mch. Tool Corp., Columbia
Oliver Mchy. Co., Grand Rapids
Reed-Prentice Co., Worcester
Rockford (Ill.) Tool Co.
Ryerson, Jos. T. & Son, Chicago
Seneca Falls Mfg. Co., Seneca Falls
Sidney Mach. Tool Co., Sydney
South Bend Lathe Wks., South Bend
Springfield Mch. T. Co., Springfield, Ohio
Walcott Lathe Co., Jackson
Whitcomb-Blaisdell Mach. Tool Co., Worcester

Lathes, Extension and Gap
American Tool Wks. Co., Cincinnati
Barnes Drill Co., Rockford
Harrington Son & Co., Ed., Phila.
Myers Mch. Tool Corp., Columbia
Ryerson & Son, Jos. T., Chicago

Lathes, Foot Power
Barnes Co., W. F. & John, Rockford
Seneca Falls Mfg. Co., Seneca Falls

Lathes, Horizontal Turret
Acme Mach. Tool Co., Cincinnati
Dreses Mach. Tool Co., Cincinnati
Foster Mach. Co., Elkhart
Gisholt Mach Co., Madison
International Mach. Tool Co., Indianapolis
Jones & Lamson Mach. Co., Springfield, Vt.
Millholland Mach. Co., Indianapolis
Pratt & Whiteny Co., Hartford
Reed-Prentice Co., Worcester
Steinle Turret Mach. Co., Madison
Warner & Swasey Co., Cleveland

Lathes, Polishing (See Polishing and Buffing Machines)

Lathes, Speed and Hand
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Diamond Mach. Co., Providence
Garvin Mach. Co., N. Y.
Greenfield Tap & Die Corp., Greenfield
Seneca Falls Mfg. Co., Seneca Falls

Lathes, Threading
Automatic Mach. Co., Bridgeport
Rivett Lathe & Grinder Co., Boston

Lathes, Vertical Turret
Bullard Mch. Tool Co., Bridgeport

Lathes, Wood Turning
Barnes Co., W. F. & John, Rockford
Blount Co., J. G., Everett
Seneca Falls Mfg. Co., Seneca Falls

Letters and Figures
Brown & Sharpe Mfg. Co., Providence
Hoggson & Pettis Mfg. Co., New Haven
Pannier Bros. Stamp Co., Pittsburgh

Lighting Fixtures
McCrosky Tool Corp., Meadville

Lockers, Clothes
Manufacturing Equip. Eng. Co., Framingham

Lubricants
Oakley Chemical Co., N. Y.
Royersford F. & M. Co., Royersford
Sun Co., Philadelphia
Texas Co., N. Y.
White & Bagley Co., Worcester

Lubricating Systems
Bassick Mfg. Co., Chicago

Machinists' Small Tools
Armstrong Bros., Tool Co., Chicago
Athol Mach. & Fdry. Co., Athol
Brown & Sharpe Mfg. Co., Providence
Pratt & Whitney Co., Hartford
Randall & Stickney, Waltham
Slocomb Co., J. T., Providence
Starrett Co., L. S., Athol
Williams & Co., J. H., Brooklyn

Mandrels, Expanding
Brown & Sharpe Mfg. Co., Providence
Cochrane-Bly Co., Rochester
Manufacturers Equip. Co., Chicago
Nicholson & Co., W. H., Wilkes-Barre
Western T. & Mfg., Springfield, O.

Mandrels, Solid
Brown & Sharpe Mfg. Co., Providence
National Twist D. & T. Co., Detroit
Nicholson & Co., W. H., Wilkes-Barre
Union Twist Drill Co., Athol

Marking Devices (See Stamps, Steel)

Marking Machines
Noble & Westbrook Mfg. Co., Hartford

Measuring Machines
Norma Co. of America, N. Y.
Pratt & Whitney Co., Hartford

Micrometer Calipers
Almond Mfg. Co., T. R., Ashburnham
Brown & Sharpe Mfg. Co., Providence
Randall & Stickney, Waltham
Slocomb Co., J. T., Providence
Starrett Co., L. S., Athol

Milling Attachments
Adams Co., Dubuque
Becker Milling Mch. Co., Hyde Park
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mch. Co.
Garvin Mach. Co., N. Y.
Hinckley Mach. Wks., Hinckley
Ingersoll Milling Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee
Kempsmith Mfg. Co., Milwaukee
LeBlond Mch. T. Co., R.K., Cincinnati
Potter & Johnston Mach. Co., Pawtucket
Standard Eng. Wks., Pawtucket

Milling Machines, Automatic
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mch. Co.
Ingersoll Milling Mch. Co., Rockford
Pratt & Whitney Co., Hartford

Milling Machines, Bench
Ames Co., B. C., Waltham
Carter & Hakes Mach. Co., Winsted
Pratt & Whitney Co., Hartford
Stark Tool Co., Waltham
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Continuous
Ingersoll Milling Mch. Co., Rockford
Newton Mch. T. Wks., Philadelphia
Potter & Johnston Mch. Co., Pawtucket

Milling Machines, Duplex
Cincinnati (O) Milling Mach. Co.
Knight Mchy. Co., W. B., St. Louis
Newton Mch. T. Wks., Philadelphia

Milling Machines, Hand
Becker Milling Mch. Co., Hyde Park
Brown & Sharpe Mfg. Co., Providence
Carter & Hakes Mach. Co., Winsted
Cincinnati (O) Milling Mach. Co.
Fox Mach. Co., Jackson, Mich.
Garvin Mach. Co., N. Y.
Pratt & Whitney Co., Hartford
Standard Eng. Wks., Pawtucket
Van Norman Mch. T. Co., Springfield Mass.
Whitney Mfg. Co., Hartford

Milling Machines, Horizontal and Planer Type
Beaman & Smith Co., Providence
Betts Mach. Co., Rochester
Ingersoll Milling Mch. Co., Rockford
Newton Mach. Tool Wks., Phila.

Milling Machines, Plain
Becker Milling Mch. Co., Hyde Park
Betts Mach. Co., Rochester
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mch. Co.
Cochrane-Bly Co., Rochester
Fox Mach. Co., Jackson, Mich.
Garvin Mach. Co., N. Y.
Ingersoll Milling Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee
Kempsmith Mfg. Co., Milwaukee
LeBlond Mch. T. Co., R.K., Cincinnati
Newton Mch. T. Wks., Philadelphia
Potter & Johnston Mach. Co., Pawtucket
Rockford (Ill.) Milling Mch. Co.
Ryerson, Jos. T. & Son, Chicago
Standard Eng. Wks., Pawtucket
Van Norman Mch. T. Co., Springfield Mass.

Milling Machines, Portable
Ingersoll Milling Mch. Co., Rockford
Newton Mach. Tool Wks., Phila.
Underwood Corp., H. B., Philadelphia

Milling Machines, Thread
Automatic Machine Co., Bridgeport
Foster Machine Co., Elkhart
Gisholt Mach. Co., Madison
Hall Planetary Thread Milling Mch. Co., Philadelphia
Harrington, Son & Co., Ed., Phila.
Newton Mach. Tool Wks., Phila.
Pratt & Whitney Co., Hartford
Waltham Mach. Wks., Waltham

Milling Machines, Universal
Becker Milling Mch. Co., Hyde Park
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mch. Co.
Cochrane-Bly Co., Rochester
Fox Mach. Co., Jackson, Mich.
Garvin Mach. Co., N. Y.
Ingersoll Milling Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee
Kempsmith Mfg. Co., Milwaukee
LeBlond Mch. T. Co., R.K., Cincinnati
Potter & Johnston Mach. Co., Pawtucket
Ryerson, Jos. T. & Son, Chicago
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Vertical
Becker Milling Mch. Co., Hyde Park
Betts Mach. Co., Rochester
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mch. Co.
Cochrane-Bly Co., Rochester
Garvin Mach. Co., N. Y.
Ingersoll Milling Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee
Knight Mchy. Co., W. B., St. Louis
LeBlond Mch. T. Co., R.K., Cincinnati
Newton Mach. Tool Wks., Phila.
Potter & Johnston Mach. Co., Pawtucket
Rockford (Ill.) Milling Mch. Co.
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Worm
Cleveland (O.) Automatic Mch. Co.
Newton Mach. Tool Wks., Phila.
Waltham Mach. Works, Waltham

Milling Tools, Adjustable Hollow
Geometric Tool Co., New Haven

Motors, Electric
Burke Electric Co., Erie
Reliance Elect. & Eng. Co., Cleveland
Westinghouse Elect. & Mfg. Co., E. Pittsburgh
Wisconsin Elect Co., Racine

Nut Tappers (See Bolt and Nut Machinery)

Oil and Grease Cups
Bassick Mfg. Co., Chicago
Bay State Stamping Co., Worcester
Bowen Products Corp., Auburn
Gits Bros. Mfg. Co., Chicago
Tucker, W. A. & C. F., Hartford

Oil Filtering and Storage Systems
Oil & Waste Saving Mch. Co., Phila.

Oil Groving Machines
National Mch. T. Co., Cincinnati

Oil Stones
Norton Co., Worcester

Oils
Sun Co., Philadelphia
Texas Co., N. Y.
White & Bagley Co., Worcester

Oxygen
Linde Air Products Co., N. Y.

Packing, Hydraulic
Chicago Rawhide Mfg. Co., Chicago
Schieren Co., Chas. A., N. Y.

Packing, Steam
Greene, Tweed & Co., N. Y.

Pattern- Shop Machinery (See Woodworking Machinery)

Patterns, Wood and Metal
Mehl Mach. Tool & D. Co., Roselle

Photographic Duplicating Machines
Photostat Corp., Rochester

Pipe Bending Machines
Harrington, Son & Co., Ed., Phila.
Underwood Corp., H. B., Philadelphia

Pipe Cutting and Threading Machines
Bignall & Keeler Mch. Wks., Edwardsville
Fox Mach. Co., Jackson, Mich.
Greenfield Tap & Die Corp., Greenfield
Harrington & Son Co., Ed., Phila.
Landis Machine Co., Waynesboro
Merrell Mfg. Co., Toledo
Murchey Mch. & T. Co., Detroit
Saunders Sons, D., Yonkers
Trimont Mfg. Co., Roxbury

Pipe Fitters' Tools
Butterfield & Co., Derby Line
Greenfield Tap & Die Corp., Greenfield
Saunders Sons, D., Yonkers
Trimont Mfg. Co., Roxbury
Williams & Co., J. H., Brooklyn

Piston-Ring Machines
National Acme Co., Windsor, Vt.
Potter & Johnston Mach. Co., Pawtucket
Walker Co., O. S., Worcester

Planers, Parallels
Walker Co., O. S., Worcester

Planing Machines
American Tool Wks. Co., Cincinnati
Betts Machine Co., Rochester
Cincinnati Planer Co., Cincinnati
Gray Co., G. A., Cincinnati
Hamilton Mach. Tool Co., Hamilton
Liberty Mach. T. Co., Hamilton
Newton Mach. Tool Works, Phila.
Ryerson, Jos. T. & Son, Chicago
Sellers & Co., Wm., Philadelphia
Whitcomb-Blaisdell Mch. Tool Co., Worcester

Planing Machines, Rotary
Newton Mach. Tool Wks. Phila.
Underwood Corp., H. B., Philadelphia

Pneumatic Tools
Anderson Bros. Mfg. Co., Rockford
Chicago Pneumatic Tool Co., Chicago
Independent Pneu. T. Co., Chicago

Polishing and Buffing Machines
Barnes Co., W. F. & John, Rockford
Blanchard Machine Co., Cambridge
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Bryant Chuck Grinder Co., Springfield, Vt.
Diamond Mach Co., Providence
Gardner Mch. Co., Beloit
Greenfield Tap & Die Corp., Greenfield
Heald Mach. Co., Worcester
Independent Pneu. T. Co., Chicago
Landis Tool Co., Waynesboro
Newton Mach. Tool Wks., Phila.
Noble & Westbrook Mfg. Co., Hartford
Potter Tool & Mach. Wks., N. Y.
Rivett Lathe & Grinder Co., Boston
Rowbottom Mach. Co., Waterbury
Royersford F. & M. Co., Royersford
Safety Emerg. Wheel Co., Springfield, O.
Union Twist Drill Co., Athol
U. S. Elec. Tool Co., Cincinnati
Van Norman Mach. Tool Co., Springfield, Mass.
Walker & Co., O. S., Worcester
Wisconsin Elect. Co., Racine

Presses, Arbor
Atlas Press Co., Kalamazoo
Barnes Co., W. F., & John, Rockford
Crane Puller Co., Arlington
Nicholson & Co., W. H., Wilkes-Barre

Presses, Broaching
Atlas Press Co., Kalamazoo

Presses, Drop and Forging
Ames Mch. Co., Max, N. Y.
Bliss Co., E. W., Brooklyn
Elmes Eng. Wks., Charles F., Chicago
Swaine Mfg. Co., Fred J., St. Louis
Toledo Machine & Tool Co., Toledo
U. S. Tool Co., Newark

Presses, Foot and Hand
Atlas Press Co., Kalamazoo
Bliss Co., E. W., Brooklyn
Ferracute Mach. Co., Bridgeton
Niagara Mch. & T. Wks., Buffalo
Shuster Co., F. B., New Haven
Taylor & Fenn Co., Hartford

Presses, Forcing
Ames Mach. Co., Max, N. Y.
Atlas Press Co., Kalamazoo
Barnes Co., W. F. & John, Rockford
Hydraulic Press Mfg. Co., Mt. Gilead
Lucas Machine Tool Co., Cleveland

Presses, Hydraulic
Burroughs Composition M'chy. Corp., Newark
Elmes Eng. Wks., Charles F., Chicago
Hydraulic Press Mfg. Co., Mt. Gilead
Oilgear Co., Milwaukee
Watson-Stillman Co., N. Y.

Presses, Power
Ames Mach. Co., Max, N. Y.
Barnes Co., W. F. & John, Rockford
Bliss Co., E. W., Brooklyn
Ferracute Machine Co., Bridgeton
Henry & Wright Mfg. Co., Hartford
Niagara Mch. & Tool Wks., Buffalo
Rowbottom Mach. Co., Waterbury
Stoll Co., D. H., Buffalo
Swaine Mfg. Co., Fred J., St. Louis
Toledo Mach. & Tool Co., Toledo
V. & O. Press Co., Glendale, N. Y.

Presses, Screw
Barnes Co., W. F. & John, Rockford
Bliss Co., E. W., Brooklyn
Niagara Mch. & T. Wks., Buffalo

Profiling Machines
Becker Milling Mch. Co., Hyde Park
Cochrane-Bly Co., Rochester
Garvin Mach. Co., N. Y.
Newton Mach. Tool Wks., Phila.
Pratt & Whitney Co., Hartford
Stark Tool Co., Waltham
Wade-American Tool Co., Waltham

Pullers, Wheel
Crane Puller Co., Arlington

Pulley Turning and Boring Machines
American Tool Works Co., Cincinnati

Pulleys, Cork Insert
American Pulley Co., Philadelphia

Pulleys, Metal
American Pulley Co., Philadelphia
Brown Co., A. & F., N. Y.
Brown & Sharpe Mfg. Co., Providence
Caldwell & Son Co., H. W., Chicago
Johnson Mach. Co., Carlyle, Manchester
Jones Fdry. & Mch. Co., W. A., Chicago
Wilmarth & Morman Co., Grand Rapids

Pumps, Hydraulic
Burroughs Composition Mchy. Corp., Newark
Elmes Eng. Wks., Chas. F., Chicago
Hydraulic Press Mfg. Co., Mt. Gilead

Pumps, Lubricant and Oil
Brown & Sharpe Mfg. Co., Providence
Oilgear Co., Milwaukee

Pumps, Power
Sullivan Machy. Co., Chicago

Punches, Center
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol

Punches, Hand
Armstrong-Blum Mfg. Co., Chicago

Punches, Power
Birdsboro Steel F. & M. Co., Birdsboro
Buffalo Forge Co., Buffalo
Ferracute Machine Co., Bridgeton
Long & Allstatter Co., Hamilton
Mitts & Merrill, Saginaw
Niagara Mch. & T. Wks., Buffalo
Royersford F. & M. Co., Royersford
Ryerson & Son, Jos. T., Chicago
Watson-Stillman Co., N. Y.

Pyrometers, Electric
Bristol Co., Waterbury
Brown Inst. Co., Philadelphia

Rack Cutting Machines
Newark Gear Cut. Mch. Co., Newark

Racks, Cut
Moltrup Steel Products Co., Beaver Falls

Racks, Machine
Standard Gauge Steel Co., Beaver Falls

Racks, Storage (See Furniture, Machine Shop)

Radiators, Japanning Oven
American Gas Furnace Co., N. Y.

Rammers Foundry
Brown & Sharpe Mfg. Co., Providence
Chicago Pneumatic Tool Co., N. Y.

Rawhide, Rope
Schieren Co., Chas. A., N. Y.

Reamer, Holders
Gisholt Mach. Co., Madison
Independent Pneu. T. Co., Chicago
Victor Tool Co., Waynesboro

Reamers, Expanding
Brubaker & Bros. Co., W. L., N. Y.
Detroit Twist Drill Co., Detroit
Gisholt Mach. Co., Madison
Greenfield Tap & Die Corp., Greenfield
McCrosky Tool Corp., Meadville
Millersburg Reamer & Tool Co. Millersburg

Reamers, Solid
Brubaker & Bros. Co., W. L., N. Y.
Buckeye Twist Drill Co., Alliance
Butterfield & Co., Derby Line
Detroit Twist Drill Co., Detroit
Gammon-Holman Co., Manchester
Greenfield Tap & Die Corp., Greenfield
Morse Twist D. & M. Co., New Bedford
National Tool Co., Cleveland
National Twist D. & T. Co.,/Detroit
Reed Mfg. Co., Erie
Union Twist Drill Co., Athol
Western T. & Mfg. Co., Springfield, O.
Whitman & Barnes, Akron

Reamers, Spiral Expansion
Kruce, E. J., Detroit

Reamers, Taper
Brown & Sharpe Mfg. Co., Providence
Gammon-Holman Co., Manchester
Greenfield Tap & Die Corp., Greenfield
Union Twist Drill Co., Athol

Recorders, Pressure
Bristol Co., Waterbury
Brown Inst. Co., Philadelphia

Recorders, Temperature
Bristol Co., Waterbury

Recorders, Time
Gisholt Mach. Co., Madison

Rheostats
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Rivet-Making Machinery
Cook Co., Asa S., Hartford
National Machinery Co., Tiffin

Rivet Sets
Chicago Pneumatic Tool Co., N. Y.

Riveting Machines
Birdsboro Steel F. & M. Co., Birdsboro
Chicago Pneumatic Tool Co., N. Y.
Grant Mfg. & Mch. Co., Bridgeport
Independent Pneu. T. Co., Chicago
Shuster Co., F. B., New Haven
Townsend Mfg. Co., H. P., Hartford

Rod Cutters and Shears, Hand
Tucker, W. A. & C. F., Hartford

Rules, Steel and Wood
Brown & Sharpe Mfg. Co., Providence
Lufkin Rule Co., Saginaw
Starrett Co., L. S., Athol

Rust Preventatives
Oakley Chemical Co., N. Y.

Safety Guards
Hoevel Mfg. Corp., N. Y.

Sand Rammers, Pneumatic
Chicago Pneumatic Tool Co., N. Y.
Independent Pneu. T. Co., Chicago

Saw Frames and Blades, Hack
Clemson Bros. Inc., Middletown
Diamond Saw & S. Wks., Buffalo
Napier Saw Wks., Springfield, Mass.
Starrett Co., L. S., Athol
Racine Tool & Mch. Co., Racine
Taylor-Shantz Co., Rochester
Thompson & Son Co., Hy. G., New Haven

Saw Sharpening Machines
Cochrane-Bly Co., Rochester
Greenfield Tap & Die Corp., Greenfield
Hunter Saw & Mach. Co., Pittsburgh

Saw Tables, Universal
Silver Mfg. Co., Salem

Sawing Machines, Metal
Armstrong-Blum Mfg. Co., Chicago
Birdsboro Steel F. & M. Co., Birdsboro
Cochrane-Bly Co., Rochester
Diamond Saw & S. Wks., Buffalo
Earle Gear & Mach. Co., Phila.
Greenfield Tap & Die Corp., Greenfield
Napier Saw Wks., Springfield, Mass.
Newton Mach. Tool Wks., Phila.
Peerless Mach. Co., Racine
Racine Tool & Mch. Co., Racine
Vandyck-Churchill Co., N. Y.

Sawing Machines, Power Hack
Armstrong-Blum Mfg. Co., Chicago
Clemson Bros. Inc., Middletown
Diamond Saw & S. Wks., Buffalo
Napier Saw Wks., Springfield, Mass.
Peerless Mach Co., Racine
Racine Tool & Mch. Co., Racine
Thompson & Son Co., Hy. G., New Haven
Victor Saw Wks., Middletown
Western T. & Mfg. Co., Springfield, O.

Saws, Circular Metal
Cochrane-Bly Co., Rochester
Hunter Saw & Mach. Co., Pittsburgh
Napier Saw Wks., Springfield, Mass.
Pratt & Whitney Co., Hartford
Union Twist Drill Co., Athol

Saws, Metal Band
Hunter Saw & Mach. Co., Pittsburgh
Racine Tool & Mch. Co., Racine
Silver Mfg. Co., Salem, O.

Saws, Metal Cutting
Brown & Sharpe Mfg. Co., Providence
Cochrane-Bly Co., Rochester
Hunter Saw & Mach. Co., Pittsburgh

Saws, Milling
Brown & Sharpe Mfg. Co., Providence
National Tool Co., Cleveland
Union Twist Drill Co., Athol

Saws, Screw Slotting
Brown & Sharpe Mfg. Co., Providence
Pratt & Whitney Co., Hartford
Simonds Mfg. Co., Fitchburg
Starrett Co., L. S., Athol
Union Twist Drill Co., Athol

Scales
Brown & Sharpe Mfg. Co., Providence
Lufkin Rule Co., Saginaw

Scraping Outfits
Hergi Mfg. Co., Bridgeport

Screw Driving Outfits
Hergi Mfg. Co., Bridgeport

Screw-Machine Work
Automatic Products Corp., L. I. City
Cincinnati (O.) Auto. Mch. Co.
Eastern Mach. S. Corp., New Haven
Hartford Mch. Screw Co., Hartford
Link-Belt Co., Chicago, Philadelphia
Meisel Press Mfg. Co., Boston
Morris Mach. Tool Co., Cincinnati
National Acme Co., Cleveland
National Mach. Tool Co., Cincinnati

Screw Machinery, Wood and Lag
Cook Co., Asa S., Hartford
Townsend Mfg. Co., H. P., Hartford

Screw Machines, Automatic
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Auto. Mach. Co.
Cleveland (O.) Automatic Mach. Co.
Cone Auto. Mach. Co., Windsor
Davenport Mch. T. Co., Rochester
National Acme Co., Cleveland

Screw Machines, Plain or Hand
Acme Mach. Tool Co., Cincinnati
Brown & Sharpe Mfg. Co., Providence
Cleveland (O) Auto Mch. Co.
Dreses Mach. Tool Co., Cincinnati
Foster Mach. Co., Elkhart
Garvin Mach. Co., N. Y.
Greenfield Tap & Die Corp., Greenfield
Jones & Lamson Mach. Co., Springfield, Vt.
Millholland Mach. Co., Indianapolis
Warner & Swasey Co., Cleveland

Screw Plates
Brubaker & Bros. Co., W. L., N. Y.
Butterfield & Co., Derby Line
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Greenfield Tap & Die Corp., Greenfield
Morse Twist D. & M. Co., New Bedford

Screws, Cap and Set
Allen Mfg. Co., Hartford
Bristol Co., Waterbury
Hartford Mch. Screw Co., Hartford
National Acme Co., Cleveland

Screws, Machine
Allen Mfg. Co., Hartford
Bristol Co., Waterbury

Screws, Safety Set (See Screws, Cap and Set)

Seamless Tubing. (See Tubing, Seamless Steel)

Second-Hand Machinery (See Searchlight Section)
Asher Mchy. Corp., Newark
Bath & Co., Cyril J., Cleveland
Botwinik Bros., New Haven
Brownell Mchy. Co., Providence
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Eddy Mchy. Co., E. A., Providence
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An "*Accumulator-less*" Hydraulic Press!

OILGEAR
VARIABLE SPEED

The OILGEAR Press has all of the advantages of the ordinary hydraulic press combined with the convenience of line shaft or motor drive.

The OILGEAR Hydraulic Press can be belted up wherever mechanical power is available, and is entirely independent of accumulator and auxiliary pump. It is controlled by and gets its pressure from an OILGEAR variable delivery pressure pump which is set up right at the press.

Accurate Ram Control

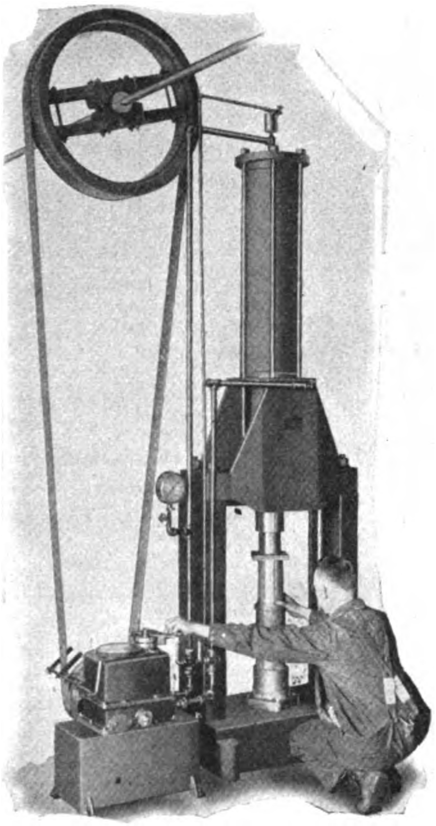
By means of a controller handle which varies the stroke of the pump, the speed of ram movement may be controlled in either direction. For fast, light work, a rapid advance is available, together with a still more rapid withdrawal action.

No power is wasted in maintaining pressure against a weighted accumulator tank or through by-pass valves.

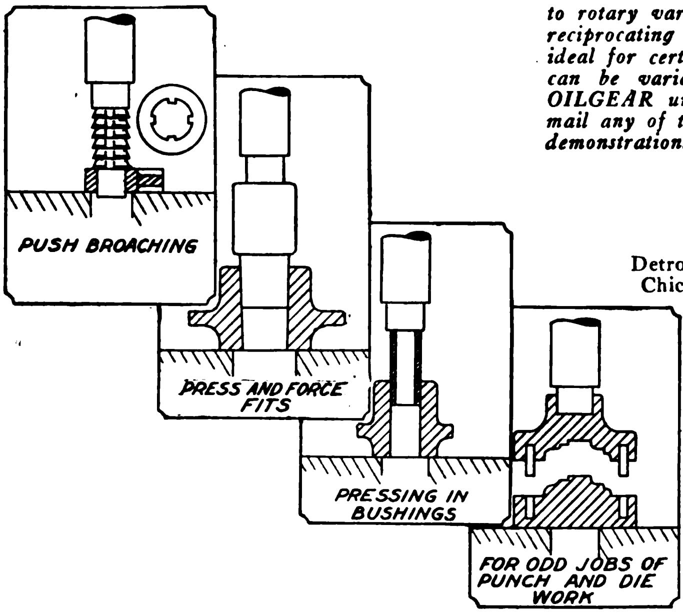
Pressing with ordinary hydraulic outfits generally involves "teasing" the ram up to the position of maximum advance. But the OILGEAR Press is so safeguarded that the ram may be run at full speed against block stops without injury or danger. It just simply stops when the pressure for which the overload mechanism has been set is exceeded. This feature adds to the speed of repetitive work.

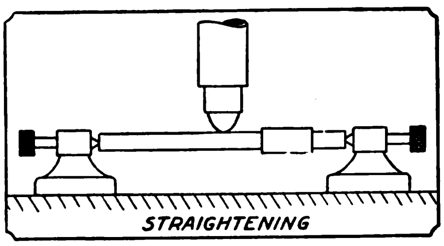
Without Pulsation

The ram movement has none of the jerkiness characteristic of pump-driven presses which advance with a sort of pulsating action, nor does its ram speed vary with the load, as happens with accumulator driven-presses. The delivery of pressure in the OILGEAR Press is so smooth that the motion of the ram is as continuous and positive and under as perfect control as the human hand.



The OILGEAR Hydraulic Press is the best general purpose means for:





Bulletins 5-A and 5-B describe the twenty and fifty-ton OILGEAR Presses. Other bulletins cover the application of the OILGEAR Variable Delivery Pump to rotary variable speed power transmissions and to hydraulic cylinders for reciprocating motions such as feeding machine tools. Small Oilgear presses are ideal for certain classes of bench assembly work. Size, rapidity and control can be varied to suit the requirements. We are anxious to have the OILGEAR understood by the engineering profession and will be glad to mail any of these bulletins to individuals as well as to companies. Working demonstrations may be seen at the main office or branches.

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Chicago: R. E. Ellis Engineering Co., 621 Washington Blvd.

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Morse Chain Co., Ithaca
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Noble & Westbrook Mfg. Co., Hartford
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Jessop & Sons, Wm., N. Y.
Palmer Co., M. A., Boston
Vanadium-Alloys Steel Co., Pittsburgh
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Stellite
Haynes Stellite Co., Kokomo

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Brown Inst. Co., Philadelphia

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Lufkin Rule Co., Saginaw
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Evans Stamp. & Plat. Co., Taunton
Fox Mach. Co., Jackson, Mich.
Garvin Mach. Co., N. Y.
Geometric Tool Co., New Haven
Harrington Son & Co., Edwin, Phila.
Hoefer Mfg. Co., Freeport
Langelier Mfg. Co., Cranston
McCrosky Tool Corp., Meadville
Moline Tool Co., Moline
Nat'l Automatic T. Co., Richmond
National Machinery Co., Tiffin
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Butterfield & Co., Derby Line
Card Mfg. Co., S. W., Mansfield
Greenfield Tap & Die Corp., Greenfield
Morse Twist D. & M. Co., New Bedford
National Tool Co., Cleveland
Pratt & Whitney Co., Hartford

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Errington Mech. Laboratory, N. Y.
Geometric Tool Co., New Haven
Manufacturers Equip. Co., Chicago
Murchey Mch. & T. Co., Detroit
National Acme Co., Cleveland
Victor Tool Co., Waynesboro

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Brown Inst. Co., Philadelphia

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Geometric Tool Co., New Haven
Greenfield Tap & Die Corp., Greenfield
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mach. Co., Waynesboro
Murchey Mch. & T. Co., Detroit
National Acme Co., Cleveland
Pratt & Whitney Co., Hartford
Rivett Lathe & Grinder Co., Boston
Victor Tool Co., Waynesboro

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Eastern Mch. S. Corp., New Haven
Geometric Tool Co., New Haven
Greenfield Tap & Die Corp., Greenfield
Hall Planetary Thread Milling Mch. Co., Philadelphia
Landis Mach. Co., Waynesboro
National Acme Co., Cleveland
National Machinery Co., Tiffin
Universal Mch. Co., Bowling Green

Thread-Rolling Machines
National Mchy. Co., Tiffin

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Gisholt Mach. Co., Madison
Lovejoy Tool Co., Springfield, Vt.
Mayhew Steel Products, N. Y.
Pratt & Whitney Co., Hartford
Western T. & Mfg. Co., Springfield, O.
Willard Tool Co., Stratford
Williams & Co., J. H., Brooklyn

Tool Posts, Lathe
Armstrong Bros. Tool Co., Chicago
Williams & Co., J. H., Brooklyn

Tools, Small (See Machinists' Small Tools)

Tool Work
(See Contract Work)

Torches, Blow
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Tractors, Industrial
Elwell-Parker Elec. Co., Cleveland

Transformers
Foote Bros. Gear & M. Co. Chicago
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Baldwin Chain & Mfg. Co., Worcester
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Link-Belt Co., Chicago, Philadelphia
Moore & White Co., Philadelphia
Morse Chain Co., Ithaca
Oilgear Co., Milwaukee
Royersford F. & M. Co., Royersford

Transportation Systems (See Trucks)

Trolleys and Tramways
Curtis Pneu. Mchy. Co., St. Louis
Harrington, Son & Co., Ed., Phila.
Shepard Elec. C. & H. Co., Montour Falls

Trucks, Industrial Motor
Elwell Parker Elec. Co., Cleveland

Tubing, Flexible
Almond Mfg. Co., T. R., Ashburnham

Tubing Seamless, Steel Brass & Copper
National Tube Co., Pittsburgh

Turret Heads
Almond Mfg. Co., T. R., Ashburnham

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Turrets, Tool Post
American Tool Wks. Co., Cincinnati

Unions, Pipe
Dart Mfg. Co., E. M., Providence

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Apex Mach. Co., Dayton
Baush Mch. T. Co., Springfield, Mass.
Boston Gear Wks., Quincy
Dexter Co., I. H. Goshen
Gray & Prior Mach. Co., Hartford
Universal Mch. Co., Bowling Green

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Burroughs Composition Mchy. Corp., Newark
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Hydraulic Press Mfg. Co., Mt. Gilead
Watson-Stillman Co., N. Y.

Vise Stands
Western T. & Mfg. Co., Springfield, O.

Vises, Drilling Machine
Armstrong-Blum Mfg. Co., Chicago
Armstrong Bros. Tool Co., Chicago
Brown Engineering Co., Reading
Hartford Special Mchy. Co., Hartford
Hoggson & Pettis Mfg. Co., New Haven
Yost Mfg. Co., Meadville, Pa.

Vises, Metal Workers'
Athol Mach. & Fdry. Co., Athol
Hartford Special Mchy. Co., Hartford
Reed Mfg. Co., Erie, Pa.
Western T. & Mfg. Co., Springfield, O.
Yost Mfg. Co., Meadville

Vises, Milling Machine
Brown & Sharpe Mfg. Co., Providence
Cochrane-Bly Co., Rochester
Cincinnati (O) Milling Mach. Co.
Greenfield Tap & Die Corp., Greenfield
Hartford Special Mchy. Co., Hartford
Standard Eng. Wks., Pawtucket
Yost Mfg. Co., Meadville

Vises, Pipe
Athol Mach. & Fdry. Co., Athol
Butterfield & Co., Derby Line
Greenfield Tap & Die Corp., Greenfield
Reed Mfg. Co., Erie, Pa.
Saunders Sons, D., Yonkers
Western T. & Mfg. Co., Springfield, O.
Williams & Co., J. H., Brooklyn
Yost Mfg. Co., Meadville

Vises, Planer and Shaper
American Tool Wks. Co., Cincinnati
Cincinnati Planer Co., Cincinnati
Hartford Special Mchy. Co., Hartford
Hoggson & Pettis Mfg. Co., New Haven
Yost Mfg. Co., Meadville

Vises, Universal Machine
Brown & Sharpe Mfg. Co., Providence
Graham Mfg. Co., Providence
Hartford Special Mchy. Co., Hartford
Hoggson & Pettis Mfg. Co., New Haven
Horton & Son Co., E., Windsor Locks
Kempsmith Mfg. Co., Milwaukee
Skinner Chuck Co., New Britain, Ct.
Yost Mfg. Co., Meadville

Vises, Wood Workers'
Yost Mfg. Co., Meadville

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Brown Inst. Co., Philadelphia
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Link-Belt Co., Chicago, Philadelphia

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Manufacturing Equip & Eng. Co., Framingham

Washers
Detroit Stamping Co., Detroit

Welding, Electric (See Welding Machines, Electric)

Welding Machines, Electric
Federal Mach. & Welder Co., Warren
Thomson Elec. Welding Co., Lynn
Thomson Spot Welder Co., Lynn
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Welding Machines, Oxy-Acetylene
Imperial Brass Mfg. Co., Chicago
Linde Air Products, N. Y.

Welding, Oxy-Acetylene (See Welding Machines, Oxy-Acetylene)

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Hawkridge Bros., Co., Boston

Wire & Cable
Simplex Wire & Cable Co., Boston

Wire Straightening and Cutting Machinery
Rowbottom Mach. Co., Waterbury
Shuster Co., F. B., New Haven

Woodruffing Keys
Standard Gauge Steel Co., Beaver Falls

Woodworking Machinery
Blount Co., J. E. Everett
Greaves, Klusman T. Co., Cincinnati
Hergi Mfg. Co., Bridgeport
Rowbottom Mach. Co., Waterbury
Seneca Falls Mfg. Co., Seneca Falls
Silver Mfg. Co., Salem.

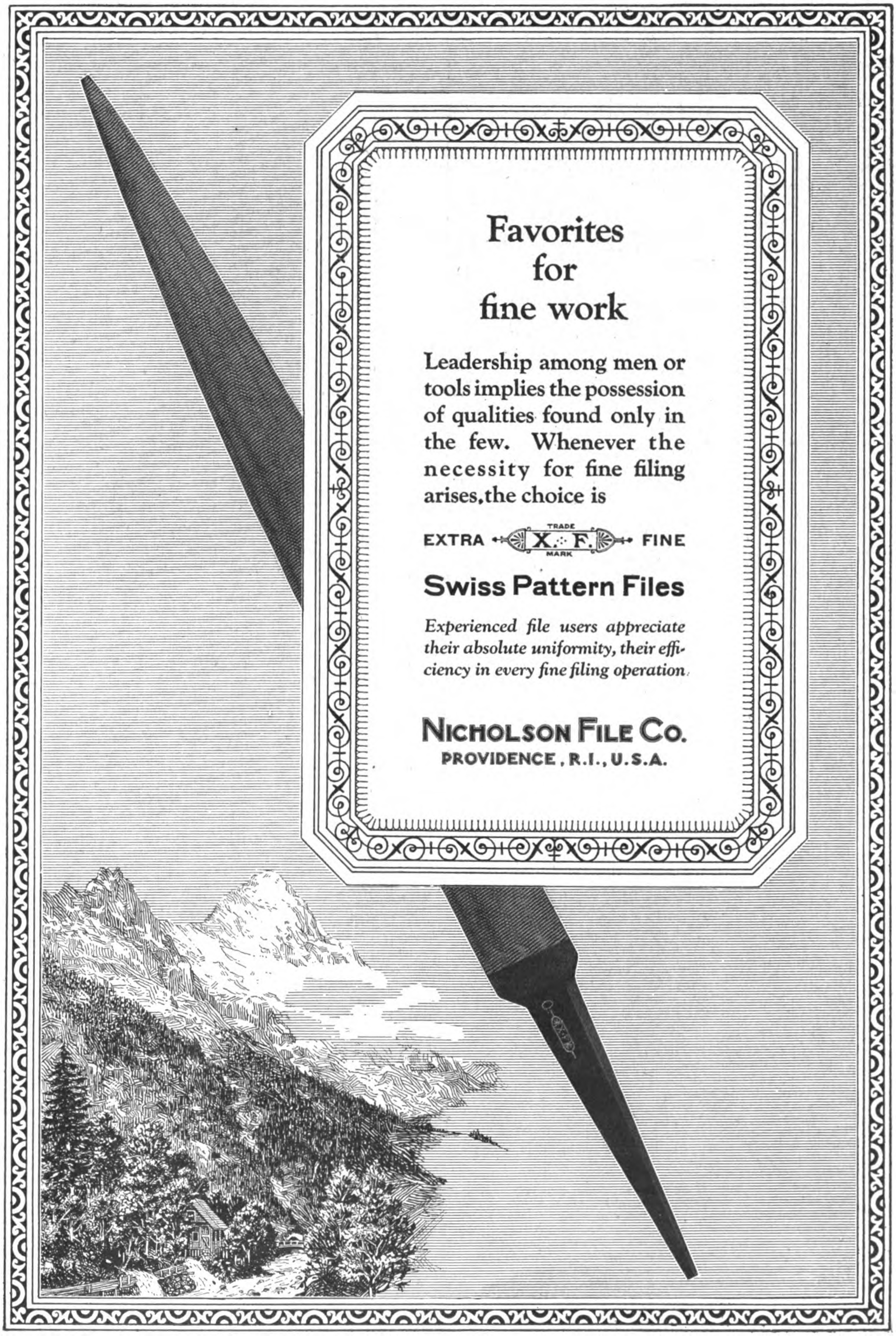
Wrenches, Drop Forged
Armstrong Bros. Tool Co., Chicago
Williams & Co., J. H., Brooklyn

Wrenches, Machinist
Trimont Mfg. Co., Roxbury
Williams & Co., J. H., Brooklyn

Wrenches, Pipe
Greenfield Tap & Die Corp., Greenfield
Trimont Mfg. Co., Roxbury
Williams & Co., J. H., Brooklyn

Wrenches, Rachet
Greene, Tweed & Co., N. Y.
Starrett Co., L. C., Athol

Wrenches, Tap
Butterfield & Co., Derby Line
Card Mfg. Co., S. W., Mansfield
Greenfield Tap & Die Corp., Greenfield
Starrett Co., L. S., Athol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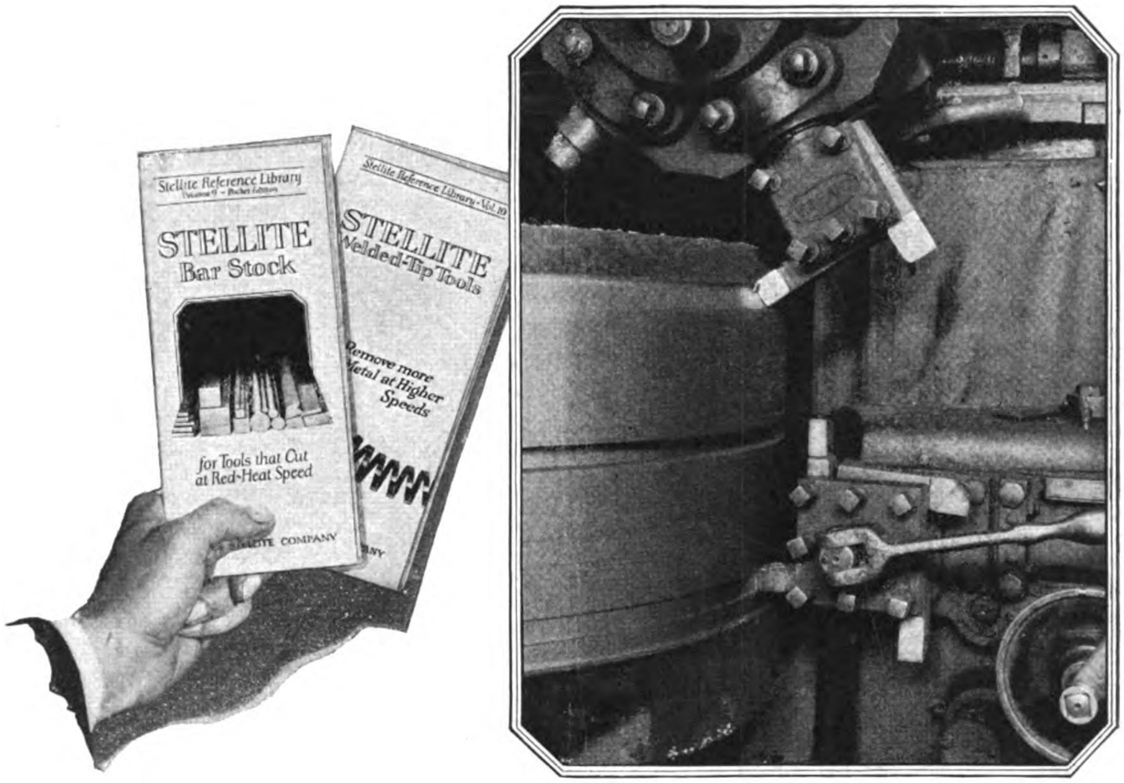

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